



# THE ASSAM GAZETTE

অসাধাৰণ

EXTRAORDINARY

প্ৰাপ্ত কৰ্তৃত্বৰ দ্বাৰা প্ৰকাশিত

PUBLISHED BY THE AUTHORITY

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No. 346 Dispur, Monday, 12th August, 2024, 21st Sravana, 1946 (S. E.)

GOVERNMENT OF ASSAM  
ORDERS BY THE GOVERNOR  
DEPARTMENT OF HOUSING AND URBAN AFFAIRS

## NOTIFICATION

The 11th July, 2024

DoHUA EcF No. 450508/2024/47.-In exercise of the powers conferred by the sectioned 14 and Section 10 of the Assam Town & Country Planning Act, 1959 (as amended) read with 2 (a) of Rule 3 of the Assam Town & Country Planning (Publication of Master Plan and the Zoning Regulations) Rules 1962, the Governor of Assam is pleased to publish the following notice regarding the publication of the Final Revised Master Plan for Greater Jorhat.

### Notice for publication of the Final Revised Master Plan for Greater Jorhat

1. It is notified that the Final Revised Master Plan for Greater Jorhat prepared under section 14 of the Assam Town & Country Planning Act, 1959 (as amended) by the Directorate of Town & Country Planning, Assam and adopted by the State Government for the area as described in the schedule below is here by published.
2. The Final Revised Master Plan with all relevant papers and maps may be inspected free of cost during the office hours at the office of Director, Town & Country Planning, Dispur, Guwahati-6, Deputy Director, Town & Country Planning, Dist Office – Jorhat, office of the District Commissioner, Jorhat, office of the Chairman, Jorhat Development Authority, office of the Chairman, Jorhat Municipal Board & Jorhat (East & West), Mariani & Teok Revenue Circle Office. Copy of the Final Revised Master Plan is available in the office of the Deputy Director, Town & Country Planning, Dist Office – Jorhat for sale on payment.

**SCHEDULE****A. SITUATION AND AREA:**

DISTRICT	: Jorhat.
Sub-Division	: Jorhat and Titabor.
Revenue Circle	: Jorhat East, Jorhat West, Mariani & Teok.
Mouza	: Jorhat Town 1,2,3 No. Mouzas, Charigaon Mouza, Garmur Mouza, Hatigarh Mouza, Charaibahi Mouza, Hazari Mouza, Khongia Mouza, Sarucharai Mouza, Parbotia Mouza, Holongapar Mouza & Katani Mouza
Master Plan	: JORHAT
Exiting Master Plan Area	: 76.29 Sq. Km
Revised Master Plan Area	: 156.75 Sq. Km
Urban Area(MB+CT+OG)	: (9.73 + 14.26 + 39.47) Sq. Km. = 63.46 Sq. Km.
Rural Area	: 93.29 Sq Km

**B. DESCRIPTION OF BOUNDARY:****BOUNDARIES:**

**North:-** Gharpholia Gaon, Koibarta Gaon, Bahona Gaon, and Balichapori Gaon.

**South :-** Charingia Gaon, Kathkotia and Chaliha Gaon.

**East :-** Bali Chapori Gaon, Meleng, Cinnamara Grant (Part) under Holongapar Mouza.

**West :-** Chalikhowa Gaon, Huj Gaon, Ahom Gaon and Purani Mati Tea Estate.

**REVENUE CIRCLE AND MAUZA WISE VILLAGES INCLUDED UNDER FINAL  
REVISED MASTER PLAN AREA FOR GREATER JORHAT**

Sl. No.	Census (2011) Code	Type of Settlement	Name of the Town/ village (As in Census of India 2011)	Rural / Urban	Mouza	Revenue Circle	Subdivision		
			<b>All town revenue blocks from block No. 1 to 18 which include-</b>	Urban/ Rural	<b>Jorhat Town 1,2,3 No. Mouzas</b>	<b>Jorhat East Circle</b>			
1		TOWN	Jorhat Town (MB)	Urban					
2	293753	TOWN	Chekonidhara (CT)	Urban					
3	293754	TOWN	Kamalabaria N.C. (CT)	Urban					
4	293684	TOWN	KamalabariaGaon (OG)	Urban					
5	293744	VILLAGE	Kalakhowa Gaon	Rural	<b>Charigaon Mouza</b>				
6	293745	VILLAGE	No.1 Bamun Gaon	Rural					
7	293746	VILLAGE	Kotoha Boria Gaon	Rural					
8	293747	VILLAGE	Aliamukhia Gaon	Rural					
9	293748	VILLAGE	No.2 Bamun Gaon	Rural					
10	293749	VILLAGE	Naosolia Gaon (NauSalia Gaon)	Rural					
11	293755	OG	Chengeli Gaon (OG)	Urban					
12	293756	OG	Gohain Tekela Gaon (OG)	Urban					
13	293737	VILLAGE	HukimaraGaon(Only Part)	Rural					

14	293738	VILLAGE	MoutGaon	Rural			Jorhat Subdivisi on
15	293739	VILLAGE	DahikhorGaon	Rural			
16	293740	VILLAGE	BaghmuriaGaon	Rural			
17	293741	VILLAGE	Chari Gaon	Rural			
18	293742	VILLAGE	Sonari Gaon	Rural			
19	293743	VILLAGE	Gajpuriya Gaon	Rural			
20	293750	VILLAGE	Duliapam Gaon	Rural	Garmur Mouza		
21	293752	TOWN	Kumar Kaibarta Gaon (CT)	Urban			
22	293757	OG	Duliagaon (OG)	Urban			
23	293758	OG	Cinnamara Grant (OG)	Urban			
24	293759	OG	Toklai Cha Bagicha (OG)	Urban			
25	293730	VILLAGE	No.2 GharPholia Gaon	Rural	Hatigarh Mouza		
26	293731	VILLAGE	No.1 Gharpholia Gaon	Rural			
27	293681	OG	Chowdang No.1 (OG)	Urban			
28	293686	OG	BarbhetaChapari (OG)	Urban			
29	293633	VILLAGE	Hazari Gaon	Rural			

**Jorhat  
Subdivisi  
on**



30	293634	VILLAGE	PakimuriHabiGaon	Rural	Charaiba hiMouza	Jorhat West Circle
31	293635	VILLAGE	Bam Chuck	Rural		
32	293661	VILLAGE	Rongai Habi	Rural		
33	293662	VILLAGE	SenchoaGaon	Rural		
34	293663	VILLAGE	ChoudangGaon No.2	Rural		
35	293664	VILLAGE	Baghmoria	Rural		
36	293665	VILLAGE	Chutiakari	Rural		
37	293675	VILLAGE	BhakatCheuni	Rural		
38	293679	TOWN	NowsoliaGaon (CT)	Urban		
39	29368	OG	Sonari Gaon (OG)	Urban		
40	293601	VILLAGE	Dulia Gaon	Rural	HazariM ouza	
41	293602	VILLAGE	RajatiaGaon	Rural		
42	293685	OG	NakariBamunGaon (OG)	Urban		
43	293636	VILLAGE	Charingia	Rural	Khongia Mouza	
44	293638	VILLAGE	Goriahabi Grant	Rural		
45	293640	VILLAGE	AjanBamunGaon	Rural		
46	293660	VILLAGE	Chaliha Gaon	Rural		
47	293659	VILLAGE	KuhiarBoria (KuhiaBoria Gaon)	Rural		
48	293639	VILLAGE	DhekeliaBorsaikiaGaon	Rural		

49	293630	VILLAGE	Porbotia Gaon	Rural	Sarucharai Mouza				
50	293631	VILLAGE	Bhatemora Gaon	Rural					
51	293682	OG	BohotiaGaon (OG)	Urban					
52	293680	OG	Sarbaibandha (OG)	Urban					
53	293677	CT	Dhekorgorha(Only Part)	Urban					
54	293678	TOWN	CharingiaGaon (CT)	Urban	Parbotia Mouza				
55	293875	VILLAGE	Meteli Gaon	Rural	Holonga par Mouza			Teok Circle	
56	293876	VILLAGE	Ghorpholia Gaon	Rural					
57	294125	VILLAGE	Kamar Hazarika Gaon	Rural	Katani Mouza	Mariani Circle	Titabar Sub Division		
58	294126	VILLAGE	Katani Gaon	Rural					
59	294127	VILLAGE	Na-Pamua (Na Pam Chowdang Gaon)	Rural					
60	294128	VILLAGE	KathkatiaGaon	Rural					
OG= Out Growth CT= Census Town									

**PABITRA RAM KHAUND,**  
Secretary to the Government of Assam,  
Department of Housing and Urban Affairs,  
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## Chapter 1: Introduction

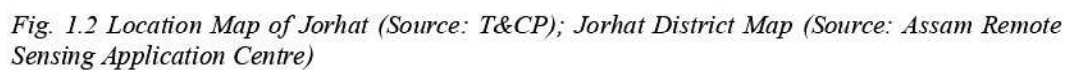
Jorhat is one of the major cities of Assam. Jorhat acts as a gateway to upper Assam and to the state of Nagaland. It was the last capital of the Ahom Kingdom and home to many historical monuments of Assamese culture. In the north of the district, the Brahmaputra River forms the largest riverine island of the world, Majuli, which spreads over 924.6 square kilometres with a population of about 150,000. The island, threatened with constant erosion by the mighty and unstable Brahmaputra River, had been the principal place of pilgrimage of Vaishnavites since the age of the Ahom rulers. Several Sattras (monasteries) resembling those of medieval times are headed by Satradhikars teaching Vaishnavism, which was introduced by Srimanta Sankardeva (1449-1568). Each Sattra has an unknown wealth of Vaishnavite scriptures and extensive revenue-free lands cultivated by the Bhakats (celebrated monks) of the Sattras. The cultural diversities which prevailed in Jorhat nearly a century ago has inspired the people to participate in cultural activities through the decades and as a result Jorhat has been able to produce many creative writers, musician, actors, historians and journalists, terming Jorhat "The Cultural Capital of Assam".



*Fig. 1.1 Aerial of Baruah Chariali, Jorhat (Source: Exclusive Northeast)*

### 1.1 Location and Area

Jorhat district is an administrative district of Assam, located in the central part of Brahmaputra Valley. The district is located between the Brahmaputra on the north and Nagaland on the south. The total geographical area of Jorhat district is 2,859.35 sq km which is equivalent to 3.63 % of the state. To the east of Jorhat district lies the Sivsagar district, to the west lies Golaghat district, to the north is Lakhimpur district and to the south lays the state of Nagaland.



## 1.2 Regional And Sub-Regional Settings

Jorhat as the potential urban centre has a distinct and unique character. It is a growing and expanding magnet of attraction for people from all across the upper Assam and also a hub for the region surrounding it. Planning for a town like Jorhat, therefore, cannot be limited within its boundaries.

There are physical potentialities for further urbanization within the Master Plan area and there is a virtual urban continuum between Jorhat and other smaller towns, which happen to be the sub-divisional town or other satellite type towns in nature. With the imperatives of growth and development, the problems of Jorhat have become more complex, which have to be viewed both as a challenge in terms of the pressures of regular and floating in-migration, as well as an opportunity in terms of planning and development in a regional context.

Jorhat is well connected by roads with all the important places of the State. The N.H. 715 passes through the town and therefore all the vehicular traffic running on this National Highway either going from Upper Assam to Lower Assam and vice-versa must pass through Jorhat.

Besides, Jorhat is connected to the whole of the country's broad-gauge railway network through Mariani junction situated only at a distance of 16 km. Jorhat is also well connected by Air connected with daily flights to Delhi, Calcutta, Guwahati and other important towns of the North East.

Jorhat is situated at the heart of three famous tourist destinations of the North East. The largest river island in the World-World Heritage site - Majuli, is situated only at a distance of 16 km. from Jorhat across the river Brahmaputra. The Kaziranga National Park - the abode of World famous one horned rhinoceros is situated at a distance of 75 kms from Jorhat. Sivasagar - another place of Archaeological importance of Assam and once the Capital of Ahom Dynasty, is only one-hour drive by road from Jorhat and situated at a distance of 56 kms.

On the north of the district, the river Brahmaputra forms the largest riverine island of the world, Majuli, spreading over 924.6 sq. km. with a population of about 1.50 lakh being threatened by the constant erosion by this mighty, unstable river. Majuli had been the principal place of pilgrimage of Vaishnavites since the ages of the Ahom rules. There are several Satras resembling medieval monasteries headed by Satradhikars preaching and teaching the Vaishnavism which was initiated by Sankardeva (1449-1568). Each Satra has unknown wealth of Vaishnav scriptures and extensive revenue free lands being cultivated by the "Bhakats" of the Satras.

## 1.3 History

"Jorhat" or "Jorehaut" means two hats or mandis-"Macharhat" and "Chowkihat" which existed on the two different banks of the river Bhugdoi during the 18th century, Jorhat was the last capital of the Ahom Kingdom. In 1794 the Ahom king Gaurinath Singha shifted the capital from Sibsagar (erstwhile "Rangpur") to Jorhat. This town was a flourishing and commercial metropolis but completely destroyed after a series of the Burmese invasions since 1817 till the arrival of the British force in 1824 under the Stewardship of David Scott and Captain Richard.

The British rule, though, was not free from rebellions and revolutions, contributed to reemergence of this historical town. From the very first decade of the British rule, the great revolutionists who emerged were Gomdhar Konwar, Jeuram and Piyali, British system of administration, came into vogue in 1839 with an established Police Thana. During the great

"Sepoy Mutiny" the anti-British plot hatched by Maniram Dewan and Piyali Barua was sabotaged, and these leaders were hanged in public at this very place in 1858.

In 1885, a narrow-gauge train service (Jorhat Provincial Railway) had come into operation and ultimately became instrumental in rapid growth of tea industry.

Though the civil sub-division under Sibsagar district at Jorhat was formed in 1869, this great place was declared as administration head quarter of the undivided Sibsagar district in 1911, which comprised the present Sibsagar, Jorhat and Golaghat and parts of Karbi-Anglong district with Major A. Playfair as the first deputy commissioner.

The modern-day district of Jorhat was created in 1983 when it was split from Sibsagar district.

## 1.4 Physical Conditions

### 1.4.1 Climate

The climate of Jorhat is characterized by hot and humid summer and cool winter. The mean annual temperature is 27<sup>0</sup> C during summer and 18<sup>0</sup> C during winter. Rainy season starts from mid-April and continues till middle of September with average annual rainfall of 2196 mm. About 64 % of the total rainfall is received during Monsoon season, July being the month of maximum rainfall. The month wise mean maximum & minimum temperature and rainfall during the period 1983-2013 are given in the **Table 1.1** below.

Table 1.1 Climate Chart of Jorhat

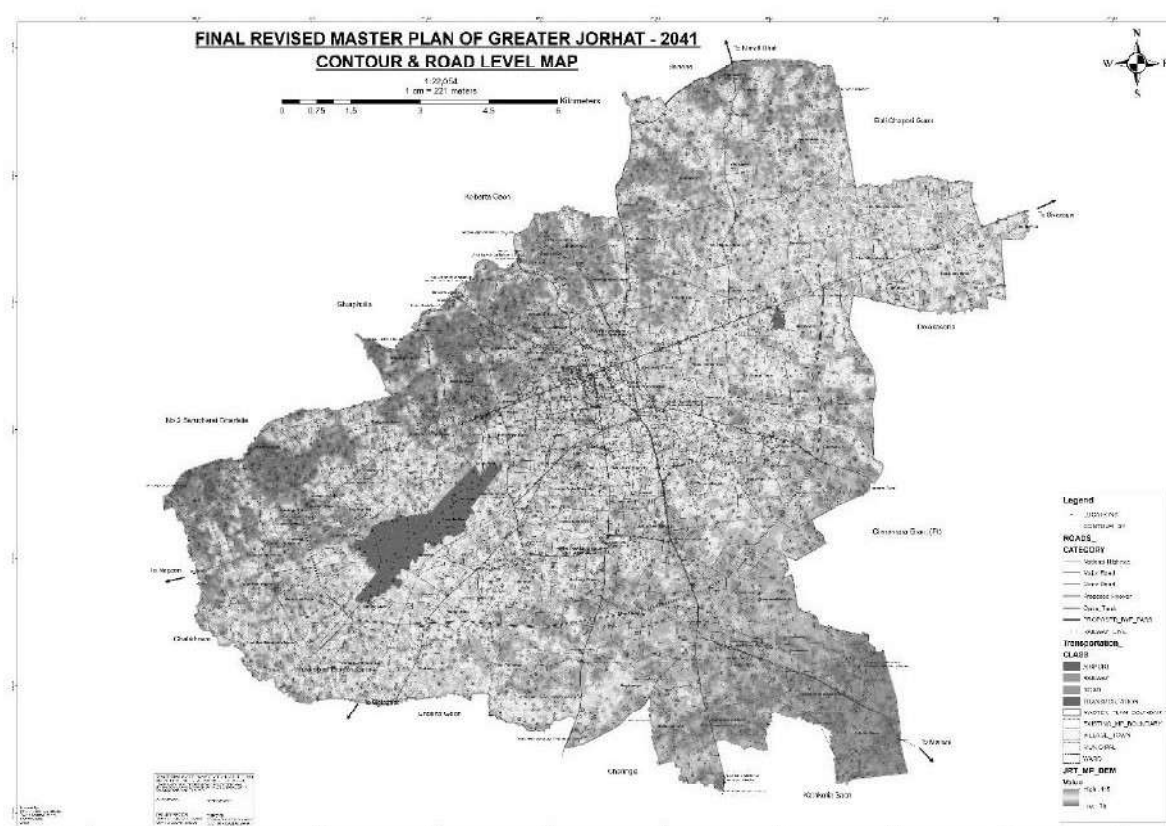
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max Temp. (°C)	22.6	24.5	27.1	28.3	30.6	31.7	31.9	32.3	31.5	30.1	27.4	26.6
Min Temp. (°C)	12.3	14.4	17.5	20.2	22.8	25.1	25.6	25.6	24.7	21.9	17.5	13.7
Avg. Temp. (°C)	17.2	19.3	22.1	23.8	25.9	27.6	28.0	28.1	27.4	25.3	21.7	18.4
Rainfall (mm)	26	61	144	276	329	454	489	438	325	127	18	2
Humidity (%)	75%	71%	69%	78%	82%	85%	85%	85%	85%	82%	78%	78%
Rainy days (d)	4	6	10	14	17	20	21	21	18	9	2	2
Sunshine days (d)	21.6	16	12.1	4.1	2.3	0.6	1	2.1	3.1	7.7	19.4	22.6
Avg. Daylight Hours (hours)	10.1	11.0	12.0	13.1	13.5	13.6	13.4	13.1	12.1	11.1	10.5	10.0
Avg. Sun Hours (hours)	7.6	8.4	9.0	8.1	8.8	9.3	9.4	9.0	8.9	8.6	8.1	7.4
Avg. Cloud Cover (%)	18%	21%	23%	29%	33%	46%	54%	46%	43%	31%	22%	19%
UV Index	5	6	6	6	6	6	6	6	6	5	5	5
Avg. Air Pressure (mBar)	1016	1014	1011	1009	1006	1002	1002	1003	1006	1011	1014	1015
Avg. Wind Speed (km/h)	3.7	4	4.8	4.7	4.6	4.3	4.7	4.4	3.8	3.6	3.5	3.5

Source: Weather.org



### 1.4.2 Topography

Jorhat is located at  $26^{\circ} 45' 28.3464''$  N latitude longitude and  $94^{\circ} 12' 35.3664''$  E longitude and at an elevation of 95.5 meters height (Observation made in 1980-1989) that is equal to 312 feet. Jorhat is situated at a distance of 315 km. east of Dispur, Guwahati the state capital of Assam. The district represents a major part of the plains of the Brahmaputra valley at an altitude of about 60 m to 140 m above the mean sea level. Some areas at the south and southeast of the district have low hill ranges, which are the continuation of the Naga Hills. The master plan area is flat to nearly level with medium settlement growths in the highland areas, the low-lying areas are often subject to moderate to severe flooding whereas the other parts have very gentle slopes with impeded drainage and occasionally affected by flood. Colluvial and alluvial materials are deposited at the foothill slopes and from the piedmont. Piedmonts and uplands are very gently sloping to gently sloping and dissected. They are mostly under tea cultivation and some parts are under forest.



Map 1.1 Topographical Map of GJRMF area (Source: T&CP)

### 1.4.3 Geology

Most part of the district is covered by alluvium deposited by the river Brahmaputra and its tributaries. The older alluvium mainly of the Pleistocene period (less than 1 million years) consists of reddish to brownish sandy clay with coarser particles of sand and newer alluvium consists of sand, silt and clay along the plains of the Brahmaputra River.

There is only a thin strip along the eastern boundaries of the district, where rocks belonging to Tipam groups of sedimentary rocks of Tertiary period consists mainly of coarse to gritty, ferruginous sandstones and shales. On the basis of climate, physiography, soil, flood proneness, socio economic condition and cropping pattern, the Jorhat district is classified into six Agro-

Ecological Situations. Out of these four (Humid Alluvial Flood Prone Situation, Chararea, Humid Alluvial Flood Free and High land) have been identified for agriculture purpose and two are related with Forest and Tea Growing area.

Major soil found in Jorhat District are

1. Old Alluvial Soil
2. New alluvial soil of riverine tract
3. Hilly soil

#### **1.4.4 Natural vegetation**

The natural vegetation comprises of different deciduous and evergreen trees, several shrubs and herbs and some grasses. The dominant tree species are: Ajhar (*Lagerstroemia flosreginae*), Bot (*Ficus bengalensis*), Boga Korol (*Alvizzip Procera*), Khokon (*Duabanga sonneratioides*), Nahar (*Mesua ferrea*), Ou tenga (*Dillenia indica*), Sonaru (*Cassia fistula*), Sisoo (*Oalbergiasisoo*), Simolu (*Bombax malabaricum*) and Bamboo (*Bambusa sp.*) etc.

The common shrubs and herbs are: Bon Ogora (*Trinmfalta bartramia*), Dudhbon (*Euphorbia hirta*), Jati bet (*Calamus tenuis*), Dhekia lata (*Stenochloa palustre*) ect. The common grasses grown in the area is Bongooti (*Chrvsopogon acientatus*), Duboribon (*Cgnodon dact ylon*), Kohua (*Saccharum spontaneum*), Ulu Khre (*Imperata cvlindica*) etc. (Jorhat Soil Report, ICAR)

### **1.5 Settlement Pattern and Rural Urban Scenario**

With the influx of population in towns and cities within a limited spatial distribution the concept of Master Plan for such towns or urban centers have come up for its orderly and planned development. This conscious effort to deal with the many fold problems in urban centers in view of perspective outlook evolved Master Plan as an instrument to promote planned physical development for the towns and cities.

With the changing dimensions and nature in the course of continuous process of development, changes in the Master Plan are reflected. Since the adoption of the Master Plan for greater Jorhat in 1977 by the Government of Assam, there has been considerable changes during the period in regard to the physical and surrounding development in the town which has now necessitated formulation of new physical plan to guide the town for integrated and boost up infrastructure development and cause for sustainable urban development.

The modified Master plan for greater Jorhat and its surrounding has been aimed to bring long term and structural solution for the pressing urban development issues and problems for the premier upper Assam town of Jorhat.

The Master Plan for Jorhat adopted by the Govt. of Assam in 1977 could able to bring about essence of urban planning in Jorhat and realize the same essence through looking back the ideas gifted by the British nearly fifty years ago.

To provide for the future projected population of the Master Plan period, 2041 within the Municipal and the proposed Revised Master Plan area respectively, integrated infrastructure development programmes particularly in respect of road/transportation network, housing, drinking water supply, solid waste management, etc. are to be drawn in a judicious and planned manner. The Revised Master Plan envisions Jorhat to always retain green cultural city- livable, eco-friendly, and humane with adequate and sustainable infrastructure services and facilities by adopting judicious and rational physical development plan coherent with its surrounding physical characteristics.



1. Jorhat, the focus of the socio-economic and political life of Assam, a symbol of ancient values and aspirations and last capital of the largest Ahom Dynasty, is assuming increasing eminence among the great cities of the State.
2. Growing at an unprecedented pace, the city needs to be able to integrate its elegant past as well as the modern developments into an organic whole, which demands a purposeful transformation of the socio-economic, natural and built environment. The city will be a prime mover and nerve center of ideas and actions, the seat of national governance and a center of business, culture, education and sports.
3. Apart from critical issues such as land, physical infrastructure, transport, ecology and environment, housing, socio-cultural and other institutional facilities, the cornerstone for making Jorhat an excellent city is the planning process itself and related aspects of governance and management. This needs a coordinated and integrated approach amongst several agencies involved with urban services and development along with a participatory planning process at local levels.

## **1.6 Need For Master Plan**

Keeping in view the democratic procedure and statutory obligations, the Draft Plan has been prepared and the views of the public will be obtained thereafter the publication of the Draft. The Draft Master Plan preparation involved extensive consultations at the pre-planning stage by involving local bodies, public sector agencies, professional groups, resident welfare associations, elected representatives, and leading citizen etc.

The Draft Master Plan envisages to issue broad guidelines for urban development which inter-alia emphasized the need to explore alternate methods of land assembly, private sector participation, and flexible land use and development norms after discussions on various aspects such as shelter, demography, conservation, transportation, industry, environment, mixed use, infrastructure, trade and commerce etc.

The success of Master Plan depends on conversion of the policies and strategies outlined in it into time bound development and action plans, periodic reviews, and close monitoring, besides the people's will and willingness to adhere to discipline in the use of land, roads, public space and infrastructure. Any issue arising from interpretation of the provisions of this Master Plan will be settled in consultation if required within the provisions of Assam Town & Country Planning Act, 1959 as amended.

### **1.6.1 Major Highlights of The Plan**

The Master Plan incorporates several innovations for the development of Jorhat, a premier town of Assam. A critical reform has been envisaged in the prevailing land policy and facilitating public - private partnerships. Together with planned development of new areas, a major focus has been on restructuring of the city transportation system connecting the hinterlands.

The Master Plan envisages vision and policy guidelines for the perspective period up to 2041. It is proposed that the Plan be reviewed at five yearly intervals to keep pace with the fast-changing requirements of the society.

The following critical areas have been the focal points of the Plan:

**1.6.1.1 Land Policy**

The land policy would be based on the optimum utilization of available resources, both, public and private in land development and creating housing stock within the Master Plan area to meet the housing requirement during the plan period.

**1.6.1.2 Public Participation and Plan Implementation**

Decentralized local area planning by participatory approach; Performance oriented planning and development, with focus on implementation and monitoring.

**1.6.1.3 Redevelopment**

Incentivized redevelopment of all the areas; (i) Planned Areas: Influence Zone along Major Transport Corridor; underutilized / low-density areas; Special Area; shopping / commercial centers; Industrial areas / clusters. (ii) Unplanned Areas: Villages; and resettlement of congested residential areas.

**1.6.1.4 Shelter**

Development of plotted housing with optimal utilization of land, private sector participation for development / redevelopment of housing;

1. Housing for poor
2. In-situ slum rehabilitation, including using land as a resource for private sector participation; In order to prevent growth of slums, mandatory provision of EWS housing / slum rehabilitation in all group housing and plotted housing development.

**1.6.1.5 Environment**

Special emphasis on conservation of Environment is taken care of. Rejuvenation of River Bhogdoi, Tarajan, Rowriahjan, Tocklaijan, Anthubhangajan, Jao-Kharia Jan, Rangajan, Duborijan etc. through a number of measures including ensuring adequate flow in river by excavation. Provision of open spaces / recreational areas and green belt to the extent of 10 to 15 % of land use. Realistic standards of water supply for equitable distribution.

**1.6.1.6 Mixed Use Planning**

To meet the growing demand of commercial activities and overcome the shortfall of available commercial space, a liberalized provision of Mixed Use of land in residential areas has been adopted adhering to the requisites of the environment, while achieving better synergy between workplace, residence and transportation. Small shops of daily needs have been permitted on ground floor, in residential areas.

**1.6.1.7 Trade & Commerce**

District & Community Centre are proposed to be developed as facility corridors along major transport networks to prevent unintended and unplanned ribbon development and for better synergy between public transport and work centre.

Development of Integrated Wholesale Markets at the urban periphery. Mandatory provisions for service and repair activities. Informal shops, weekly markets, handicrafts bazaars, used books / furniture / building materials bazaars to be developed.

**1.6.1.8 Informal Sector**

The informal and unorganized sector is a major source of employment in the economic fabric of the city for which the following approach is proposed

1. Earmarking of 'Hawking' Zones at neighbourhood and cluster levels.
2. The weekly markets to be identified and planned / developed.
3. New areas for informal trade to be developed and integrated with housing, commercial, institutional and industrial areas.
4. Provision of common basic services like toilets, water points, etc. Involvement of NGOs envisaged.

#### ***1.6.1.9 Industry***

Industry and Services contribute to 39% and 44% (2019) respectively to the GDP of Assam. Taking into care of the Environment as a major concern, industrial zones are incorporated in the land use planning and listing of industries prohibited/restricted has been incorporated in the Zoning Regulation.

1. Modernization / up-gradation of existing industries including non-conforming industrial centre.
2. Special provisions for service and repair centre.
3. Inclusion of new activities like IT industry, etc.

#### ***1.6.1.10 Conservation of Heritage***

Identification of heritage zones and archaeological parks. Development of Special Conservation plans for listed buildings and precincts.

#### ***1.6.1.11 Transportation***

The proposals include the following:

1. A new parking policy including private sector development of parking facilities, enforcement of norms for parking space, multi-level parking and underground parking are proposed to take place. Integrated multimodal public transport system to reduce dependence on personalized vehicles is also proposed.
2. Roads - Optimal use of existing road network and development of missing links.
3. Re-structuring of existing network through expressways, arterial roads, distributor roads and relief roads.
4. Provision for introducing cycle tracks, promenade, pedestrian and disabled friendly features in arterial and sub-arterial roads.

#### ***1.6.1.12 Health Infrastructure***

1. Health facilities proposed to achieve norms of 5 beds / 1000 population
2. Nursing Homes, clinics etc. also allowed under relaxed Mixed-Use norms.

#### ***1.6.1.13 Educational Facilities***

1. Rationalization with enforcement of planning norms for educational institutions.
2. Locating new school sites adjacent to parks / playgrounds.
3. Provision for vocational and other educational facilities.
4. Schools and training centre for mentally / physically challenged with differential development norms.

#### 1.6.1.14 Disaster Management

1. Disaster Management centre is provided in each administrative zone.
2. Building regulations for safety of structures as per seismic zone and NBC.
3. Land Use zoning as per micro zoning.

#### 1.6.1.15 Provision of Sports Facilities

1. Provisions for sports infrastructure for local, national and international events.
2. Incentives provided for sports facilities and swimming pools in schools, clubs and group housing.

#### 1.6.1.16 Focus on Infrastructure Development

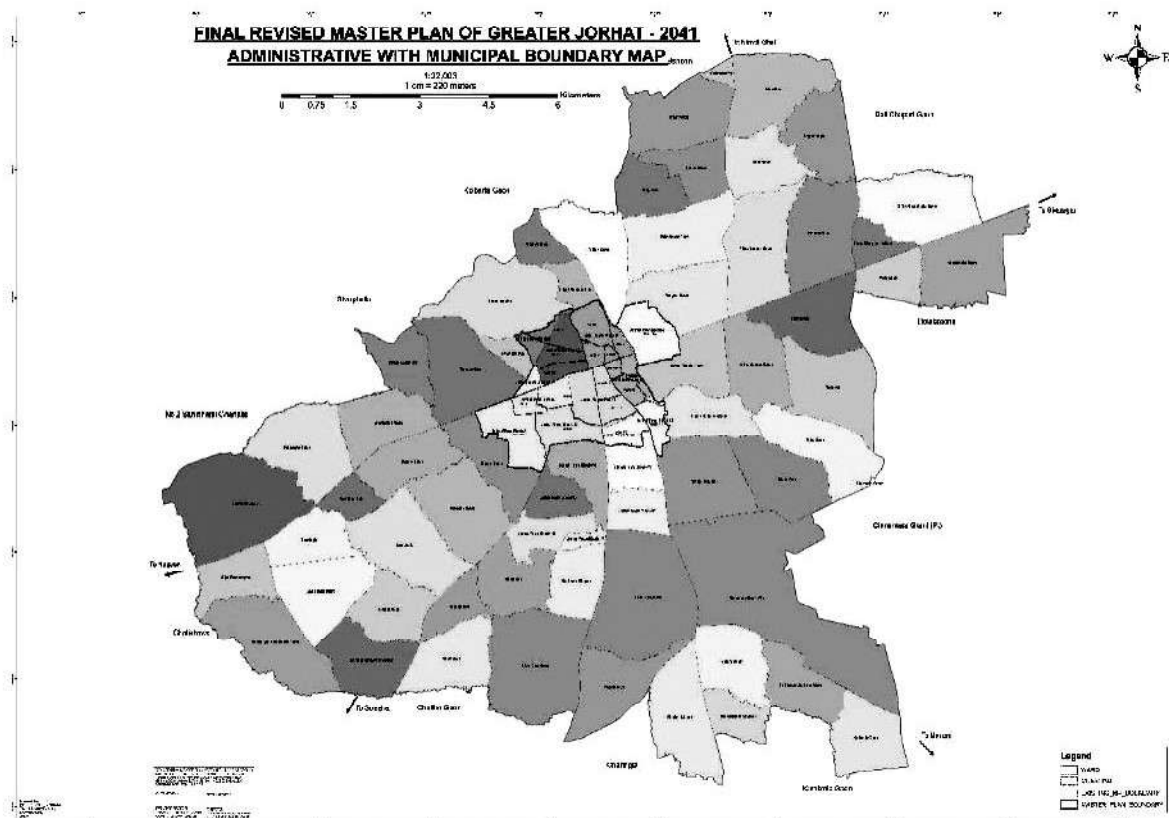
Perspective Plans for Water, Power, Drainage & Solid Waste Management of Service Agencies as part of Draft Revised Master Plan of Jorhat 2041.

#### 1.6.1.17 Alternative Sources of energy and new technology

The Plan gives emphasis on energy conservation, efficiency and exploring alternative sources of energy.

### 1.7 Greater Jorhat Revised Master Plan Area

The Greater Jorhat Revised Master Plan area consist of the Jorhat Municipal Area, 12 Outgrowths (OG), 6 Census Towns (CT), 16 villages of Jorhat East Circle, 19 Villages of Jorhat West Circle, 2 villages in Teok Circle, and 4 villages in Mariani Circle.



Map 1.2 Administrative Map of GJTMP area (Source: T&CP)

Table 1.2 Population of GJRMF area from 1951 to 2011

Sl no.	Greater Jorhat Revised Master Plan Area	Population (1951)	Population (1961)	Population (1971)	Population (1991)	Population (2001)	Population (2011)
1	Jorhat Municipal Area (Existing)	16164	24953	30247	58358	67588	71782
2	12 Outgrowths (OG)	19810	21662	29232	33526	44042	55350
3	6 Census Towns (CT)	5886	10861	11428	21700	33473	36771
4	16 Villages in Jorhat East Circle	14168	17398	20211	30833	28830	31348
5	19 Villages in Jorhat West Circle	16111	20718	25205	33054	38469	41881
6	2 Villages in Teok Circle	684	801	960	1869	2150	2385
7	4 Villages in Mariani Circle	2819	2729	3580	4191	4347	5814
	<b>Total</b>	<b>75642</b>	<b>99122</b>	<b>120863</b>	<b>183531</b>	<b>218899</b>	<b>245331</b>

\*In 1981, no Census was held in Assam

Source: Census 2011/Compilation by T&CP, Jorhat

Outgrowths and Census Towns are villages which has crossed a population of 5,000 plus as notified by the Census of India. The difference between outgrowths and census towns is that outgrowths are adjacent to municipal areas. List of 12 Outgrowths (OGs) and 6 Census Towns (CTs) which are a part of the Greater Jorhat Revised Master Plan Area are given in **Table 1.3** below.

Table 1.3 List of Outgrowths (OGs) and Census Towns (CTs) in GJRMF area

Sl no.	Name of ULB/Outgrowths/Census Towns	Revenue Circle	Mouza
1	Jorhat Municipal Area	Jorhat East	Jorhat Town 1/2/3
2	Chengeli Gaon (OG) Ward No. 020	Jorhat East	Charigaon
3	Gohain Tekela Gaon (OG) Ward No. 021	Jorhat East	Charigaon
4	Duliagaon (OG) Ward No. 022	Jorhat East	Goromur
5	Cinnamara Grant (OG) (Only part) Ward no. 23	Jorhat East	Goromur
6	Toklai Cha Bagicha (OG) Ward No. 024	Jorhat East	Goromur
7	Sarbaibandha (OG) Ward No. 025	Jorhat West	Sorucharai
8	Chowdang No.1 (OG) Ward No. 026	Jorhat East	Charaibahi
9	BohotiaGaon (OG) Ward No. 027	Jorhat West	Sorucharai
10	Sonari Gaon (OG) Ward No. 028	Jorhat West	Charaibahi
11	Kamalabaria Gaon (OG) Ward No. 029	Jorhat East	Jorhat Town 1/2/3
12	Nakari Bamun Gaon (OG) Ward No. 030	Jorhat West	Hazari
13	BarbhetaChapari (OG) Ward No. 031	Jorhat West	Charaibahi
14	Chekonidhara (CT)	Jorhat East	Jorhat Town 1/2/3
15	Kamalabaria N.C. (CT)	Jorhat East	Jorhat Town 1/2/4
16	Kumar Kaibarta Gaon (CT)	Jorhat East	Goromur
17	Nowsolia Gaon (CT)	Jorhat West	Charaibahi
18	Dhekorgorha (CT) (Only part)	Jorhat West	Sorucharai
19	Charingia Gaon (CT)	Jorhat West	Porbotia

Source: Census 2011/Compilation by T&CP, Jorhat



## Chapter 2: Demography

### 2.1 Population

As per 2011 Census, the total population of Jorhat town excluding the urban agglomeration area was 71,782 persons. The population of old Jorhat Master Plan area as per 2011 Census was 189,355 and the population of the Revised Jorhat Master Plan Area in 2011 was 245,331. There are 12 (eleven) Out Growths (OG) and 6(five) Census towns around Jorhat which form part of urban agglomeration area. The total population of OGs and CTs account for more than 50% of the total population which exerts pressure on the town's infrastructure facilities.

The population, area and population density of Revised Master Plan Area for Greater Jorhat is given in **Table 2.1** below. The population is calculated from the census of India reports for the year 2011, and the area is calculated from the GIS based software.

Table 2.1 Population Brief of GJRMF area

Sl no.	Greater Jorhat Revised Master Plan Area	Population (2011)	Percent	Area (in Hectares)	Population Density (in PPH)
1	Jorhat Municipal Area (Existing)	71782	29.26	973.4	73.74
2	12 Outgrowths (OG)	55350	22.56	3946.8	14.02
3	6 Census Towns (CT)	36771	14.99	1425.6	25.79
4	16 Villages in Jorhat East Circle	31348	12.78	3721.6	8.42
5	18 Villages in Jorhat West Circle	41881	17.07	4433.6	9.45
6	2 Villages in Teok Circle	2385	0.97	430.7	5.54
7	4 Villages in Mariani Circle	5814	2.37	742.8	7.83
	Total	245331	100	15674.47	15.65

Source: Census 2011/Compilation by T&CP, Jorhat

Share of population in the GJRMF Area is given below in the **Chart 2.1** below. The highest share of population is in the Municipal Area (29.26 %), followed by the Outgrowths with a share of 22.56 %.

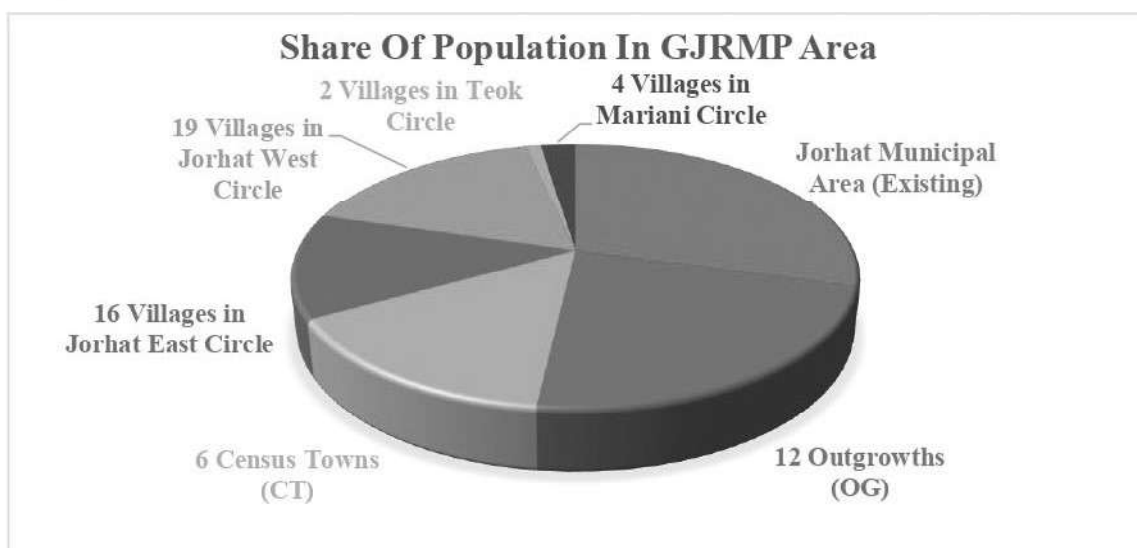


Chart 2.1 Share of Population in GJRMF area (Source: T&CP)

List of villages, outgrowths and census towns in Revised Master Plan Area for Greater Jorhat and their respective population as per Census 2011, no. of households, area (calculated as per GIS), and population density is given in **Table 2.2** below.

Table 2.2 Demographic details of administrative bodies in GJRMF area

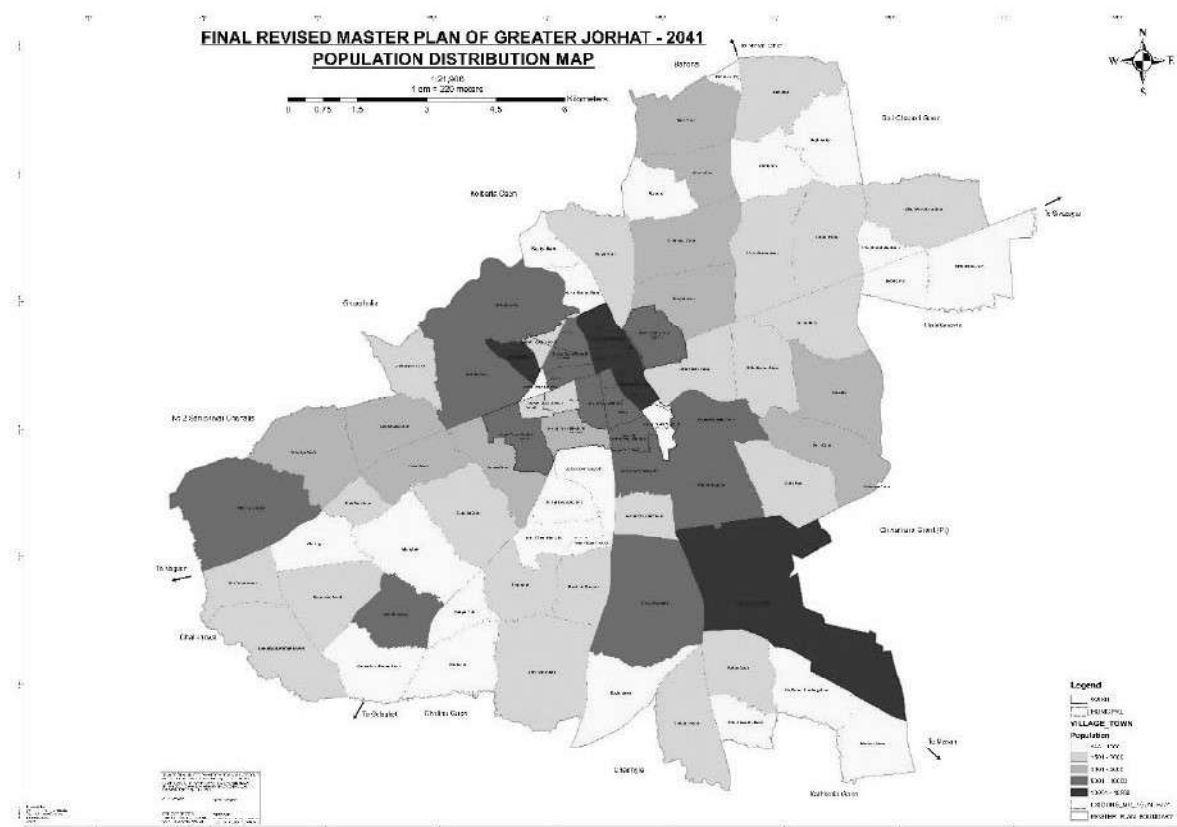
Village Code (Census 2011)	Name of Town/ Villages as in Census 2011	No. of HH	Total Population	Male	Female	Area (in Hectares)	Population Density (PPH)
Jorhat East Circle, Jorhat Town 1,2,3 no. Mouza							
801595	Jorhat (MB)	14508	71782	37474	34308	973.4	73.74
293753	Chekonidhara (CT)	1596	7355	3702	3653	234.6	31.36
293754	Kamalabaria N.C. (CT)	2335	10071	5478	4593	54.3	185.61
801595	Kamalabaria Gaon (OG) Ward No. 029	679	2911	1486	1425	399.0	7.30
	Total	19118	92119	48140	43979	1661.2	55.45
Jorhat East Circle, Charigaon Mouza							
293737	Hukimara Gaon ( <i>Only Part</i> )	98	442	217	225	25.4	17.39
293738	Mout Gaon	807	3521	1802	1719	285.8	12.32
293739	Dahikhor Gaon	444	1991	992	999	293.8	6.78
293740	Baghmuria Gaon	365	1631	812	819	223.6	7.30
293741	Chari Gaon	291	1273	667	606	196.2	6.49
293742	Sonari Gaon	178	808	420	388	151.5	5.33
293743	Gajpuriya Gaon	273	1170	584	586	154.7	7.56
293744	Kalakhowa Gaon	707	3137	1580	1557	293.6	10.69
293745	No.1 Bamun Gaon	653	2908	1434	1474	328.0	8.86
293746	Kotoha Boria Gaon	593	2688	1362	1326	311.6	8.63
293747	Aliamukhia Gaon	412	1848	943	905	256.6	7.20
293748	No.2 Bamun Gaon	471	1983	972	1011	232.1	8.54
293749	Naosolia Gaon (Nau Salia Gaon)	573	2591	1349	1242	302.2	8.57
801595	Chengeli Gaon (OG) Ward No. 020	731	3191	1631	1560	244.2	13.07
801595	Gohain Tekela Gaon (OG) Ward No. 021	676	2980	1498	1482	203.2	14.67
	Total	7272	32162	16263	15899	3502.5	9.18
Jorhat East Circle, Goromur Mouza							
293750	Duliapam Gaon	525	2620	1554	1066	259.5	10.10
293752	Kumar Kaibarta Gaon (CT)	1829	8056	4097	3959	179.8	44.82
801595	Duliagaon (OG) Ward No. 022	405	1739	888	851	261.4	6.65
801595	Cinnamara Grant (OG) ( <i>Only part</i> ) Ward no. 23	3045	13131	6824	6307	899.2	14.60

801595	Toklai Cha Bagicha (OG) Ward No. 024	1215	5123	2575	2548	314.0	16.31
	Total	7019	30669	15938	14731	1913.9	16.02
Jorhat East Circle, Hatigorh Mouza							
293730	No.2 Ghar Pholia Gaon	428	1937	964	973	322.0	6.01
293731	No.1 Gharpholia Gaon	167	800	413	387	85.0	9.41
	Total	595	2737	1377	1360	407.0	6.72
Jorhat East Circle, Charaibahi Mouza							
801595	Chowdang No.1 (OG) Ward No. 026	1741	7184	3647	3537	521.4	13.78
801595	BarbhetaChapari (OG) Ward No. 031	402	1764	868	896	167.7	10.52
	Total	2143	8948	4515	4433	689.1	12.98
Jorhat West Circle, Charaibahi Mouza							
293633	Hazari Gaon	725	3137	1570	1567	193.5	16.21
293634	Pakimuri Habi Gaon	394	1630	827	803	85.2	19.12
293635	Bam Chuck	158	714	373	341	329.6	2.17
293661	Rongai Habi	195	844	471	373	113.2	7.45
293662	Senchoa Gaon	731	2880	1436	1444	204.7	14.07
293663	Choudang Gaon No.2	561	2702	1327	1375	448.2	6.03
293664	Baghmoria	299	1410	695	715	247.5	5.70
293665	Chutiakari	306	1306	665	641	248.1	5.26
293675	Bhakat Cheuni	433	1917	975	942	300.6	6.38
293679	Newsolia Gaon (CT)	1059	4312	2145	2167	305.9	14.10
801595	Sonari Gaon (OG) Ward No. 028	960	3915	1976	1939	187.7	20.86
	Total	5821	24767	12460	12307	2664.2	9.30
Jorhat West Circle, Hazari Mouza							
293601	Dulia Gaon	738	3323	1669	1654	273.8	12.13
293602	Rajatia Gaon	326	1441	713	728	88.7	16.24
801595	Nakari Bamun Gaon (OG) Ward No. 030	264	1077	555	522	73.7	14.62
	Total	1328	5841	2937	2904	436.3	13.39
Jorhat West Circle, Khongia Mouza							
293672	Charingia	131	592	300	292	171.2	3.46
293638	Goriahabi Grant	338	1671	804	867	271.4	6.16
293640	Ajan Bamun Gaon	369	1563	805	758	165.2	9.46
293660	Chaliha Gaon	1368	6597	3886	2711	198.8	33.18
293659	Kuhlar Boria (Kuhia Boria Gaon)	309	1493	761	732	227.7	6.56
293639	Dhekelia Borsaikia Gaon	389	1739	877	862	336.7	5.17
	Total	2904	13655	7433	6222	1371.0	9.96
Jorhat West Circle, Sorucharai Mouza							
293630	Porbotia Gaon	691	3087	1583	1504	312.6	9.88
293631	Bhatemora Gaon	908	3835	1949	1886	216.8	17.69
801595	BohotiaGaon (OG) Ward No. 027	1332	5399	2801	2598	323.3	16.70



801595	Sarbaibandha (OG) Ward No. 025	1728	6936	3483	3453	352.0	19.70
293677	Dhekorgorha (CT) ( <i>Only part</i> )	402	1883	949	934	149.6	12.59
	Total	5061	21140	10765	10375	1354.3	15.61
<b>Jorhat West Circle, Porbotia Mouza</b>							
293678	Charingia Gaon (CT)	1105	5094	2615	2479	501.5	10.16
<b>Teok Circle, Holongapar Mouza</b>							
293875	Meteli Gaon	234	1061	536	525	122.9	8.63
293876	Ghorpholia Gaon	313	1324	657	667	307.8	4.30
	Total	547	2385	1193	1192	430.7	5.54
<b>Mariani Circle, Katani Mouza</b>							
294125	Kumar Hazarika Gaon	259	1267	631	636	112.8	11.23
294126	Katani Gaon	596	2351	1207	1144	223.0	10.54
294127	Na-Pamua (Na Pam Chowdang Gaon)	293	1245	619	626	191.2	6.51
294128	Kathkatia Gaon	189	951	478	473	215.8	4.41
	Total	1337	5814	2935	2879	742.8	7.83
	<b>All Total</b>	<b>54250</b>	<b>245331</b>	<b>126571</b>	<b>118760</b>	<b>15674.47</b>	<b>15.65</b>

Source: Census 2011/Compilation by T&CP, Jorhat



Map 2.1 Population Distribution Map of GJRMP area (Source: T&CP)

### 2.1.1 Population Growth in Greater Jorhat Revised Master Plan Area

Table 2.3 Growth of the Population of Jorhat Revised Master Plan Area

Year	Jorhat MB Population	Decadal Growth Rate	Old Jorhat Master Plan Area excluding MB	Decadal Growth Rate	Total Population of Old Jorhat Master Plan	Population of newly added Revised Master	Greater Jorhat Revised Master Plan Area	Decadal Growth
(i)	(ii)	(iii)	(iv)	(v)	(vi) = (ii) + (iv)	(vii)	(viii) = (vi) + (vii)	(viii)
1901	2899	-	-	-	-	-	-	-
1911	5231	<b>0.80</b>	-	-	-	-	-	-
1921	6626	<b>0.27</b>	-	-	-	-	-	-
1931	8334	<b>0.26</b>	-	-	-	-	-	-
1941	11664	<b>0.40</b>	-	-	-	-	-	-
1951	16164	<b>0.39</b>	52229	-	68393	7336	75729	-
1961	24953	<b>0.54</b>	50159	-0.04	75112	24070	99182	<b>0.31</b>
1971	30247	<b>0.21</b>	62602	0.25	92849	28014	120863	<b>0.22</b>
1991*	58358	<b>0.93</b>	79073	0.26	137431	44634	182065	<b>0.51</b>
2001	67588	<b>0.16</b>	102977	0.30	170565	48334	218899	<b>0.20</b>
2011	71782	<b>0.06</b>	117573	0.14	189355	55976	245331	<b>0.12</b>

\*Twenty years Growth Rate as in 1981 Census was not held in Assam

Source: Census 2011

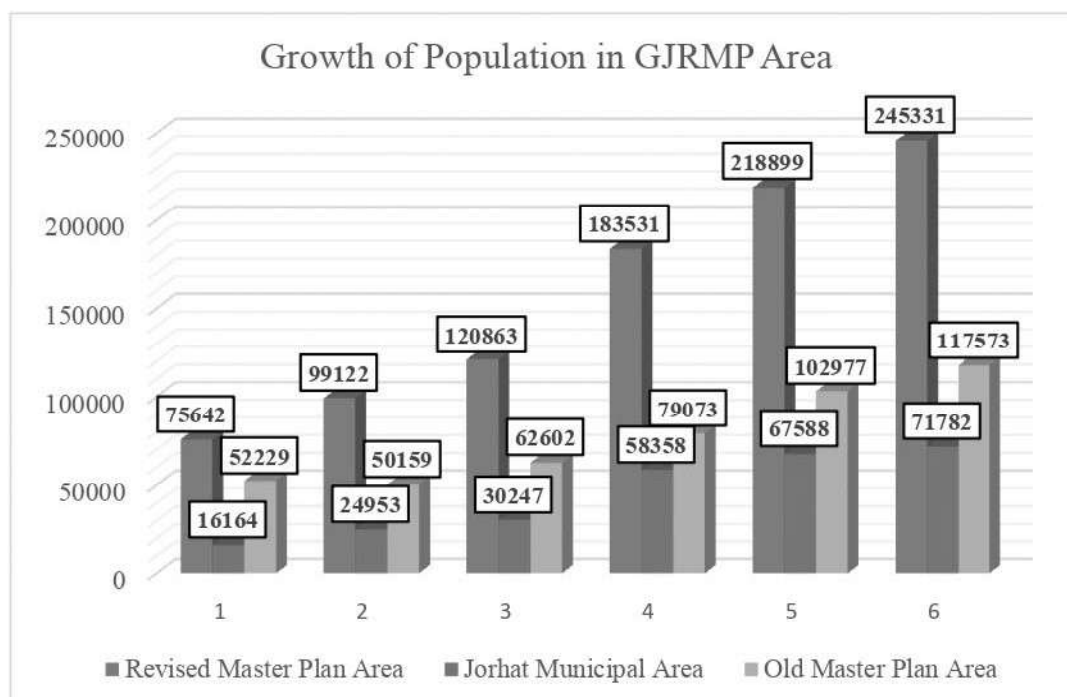


Chart 2.2 Growth of Population in GJRMP area (Source: T&CP)

The total population of Jorhat Revised Master Area as per 2001 Census including Jorhat Municipal area was 2,18,899 which rose to 2,45,331 in 2011. The growth of population in Jorhat Revised Master Plan area during the decade is 12%, which are more than the double as compared to the growth of the population in Jorhat Municipal area. This indicates that the

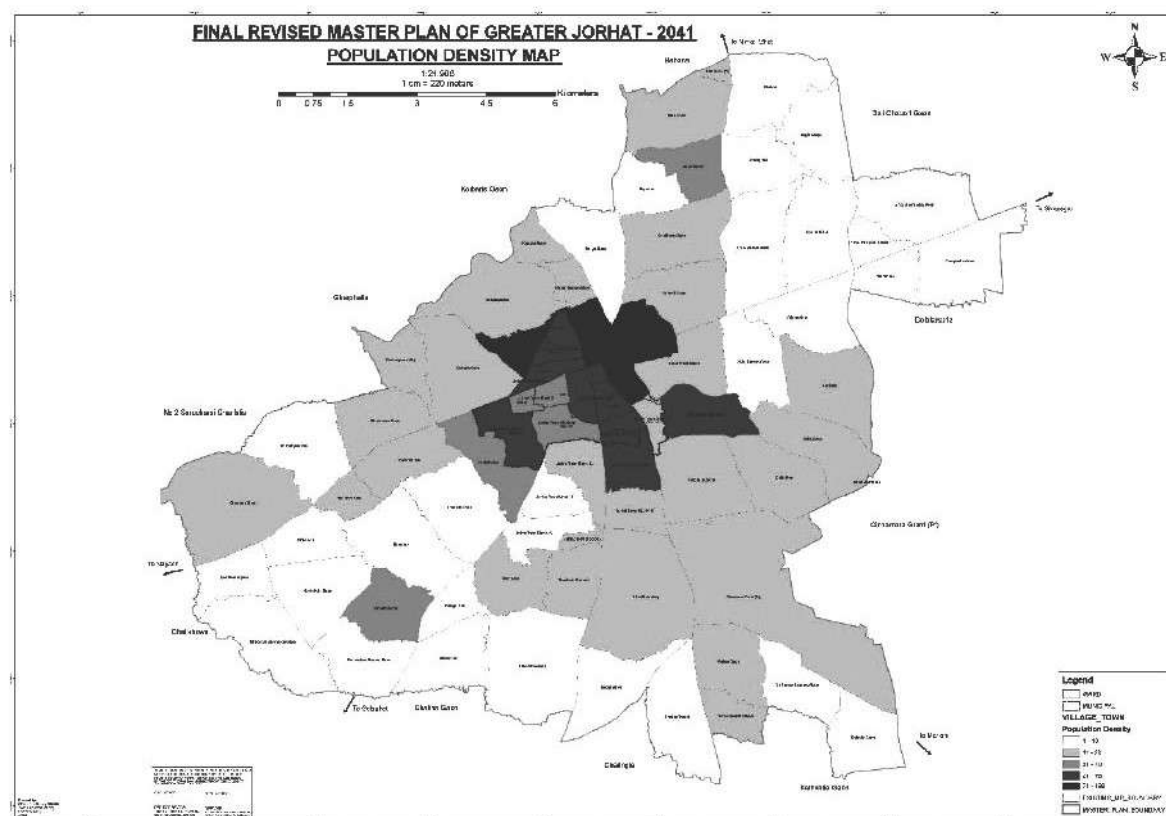
growth of population has been taking place at a faster rate outside the Municipal area, which implies the spatial development of the town. Moreover, it is clearly indicated that the percentage of the growth of population in the Master Plan area outside the Municipal area is higher than the percentage than the growth in the Municipal area during the last decade too.

## 2.2 Population Density

Population density is very crucial in the planning and administration spheres of different areas of a certain region or nation as a whole. Socially with population density the government will be able to know if public amenities in a given area are adequate to serve the given population without any strain on available resources. Economically, the density of population will assist to a certain extent in the complementarity part of spatial interactions. In simpler way construction of shops in a certain area is proportional to demand of certain commodities in that area. Thus, with density one can have a picture of the number of customers that are to be serviced with the shop/s before construction.

Historically, a larger population has always meant a higher average income per person and a longer life expectancy and a better quality of life. Throughout all known history, more densely populated cities have always provided higher real wages, and better living conditions and services than thinly populated villages or small towns. But after reaching an equilibrium, highly dense areas start to deteriorate, with low quality and living standards, scarcity of resources, and congested public places, with less share of public amenities than required.

URDPFI recommends a maximum population density of 100-150 pph in plain areas for a medium category town. The average gross population density of GJRMF Area is 1565.2 (15.65 pph) persons per sq. km.



Map 2.2 Population Density Map of GJRMF area (Source: T&CP)

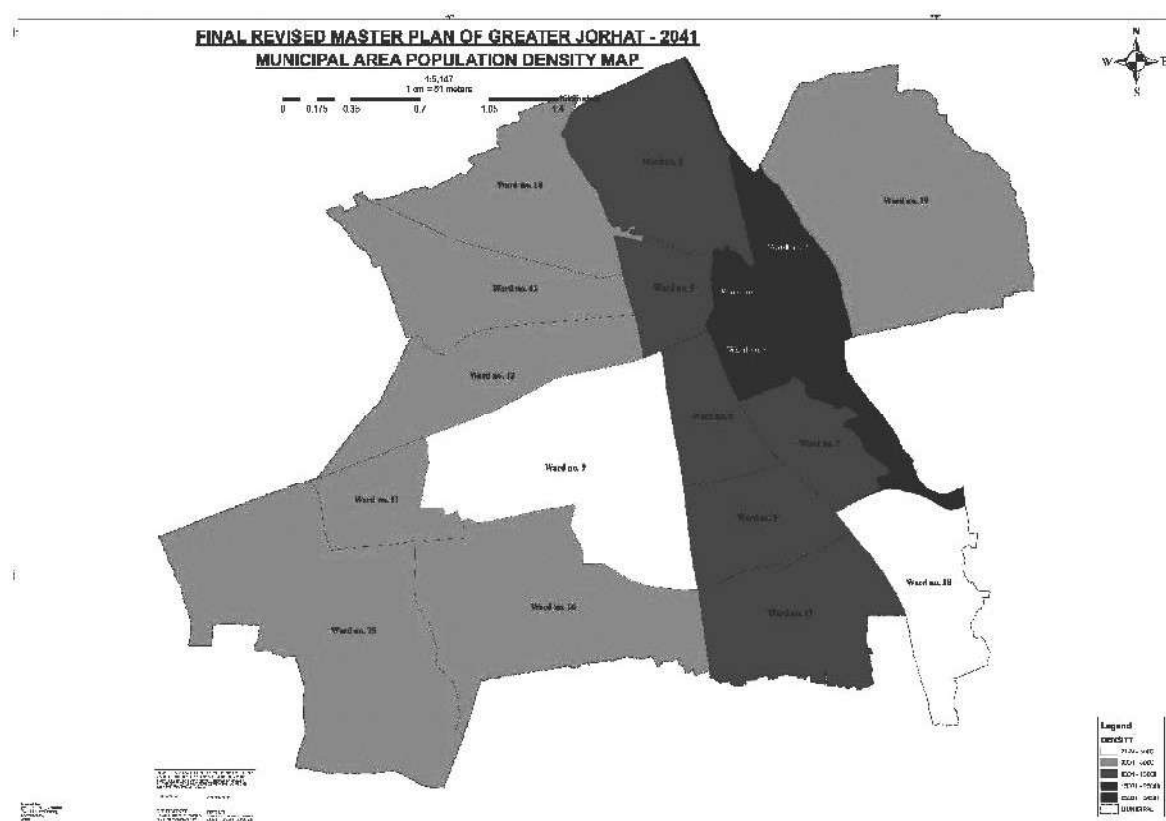
### 2.2.1 Population Density analysis of the Jorhat Municipal Area

An analysis of the Jorhat Municipal Board ward wise population variations, as shown in Table reveals a higher density of population in Ward no. 2, Ward no. 4, Ward no. 6 and Ward no. 7 with a density of 252 pph, 545.6 pph, 264.9 pph, and 159.18 pph respectively, due to concentration of commercial activities, change in occupational patterns coupled with high investments, including the opening up of shops, hotels, offices and other financial institutions.

Table 2.4 Population Density in Municipal Wards of Jorhat

Ward no.	Population			No. of Households	Area (in sq.km)	Area (in Hectare)	Population Density (PPH)
	Total	Male	Female				
1	6275	3256	3019	1511	0.61	61.0	102.90
2	5412	2987	2425	1320	0.21	21.5	252.00
3	4196	2391	1805	1159	0.28	27.6	152.08
4	4722	2598	2124	886	0.09	8.7	545.61
5	2860	1564	1296	666	0.34	34.4	83.18
6	3242	1813	1429	602	0.12	12.2	264.88
7	3405	1769	1636	702	0.21	21.4	159.18
8	2214	1122	1092	474	0.26	26.1	84.78
9	2795	1426	1369	682	0.27	26.9	103.96
10	2127	1030	1097	547	1.00	99.9	21.29
11	1523	766	757	390	0.27	26.6	57.30
12	2229	1076	1153	568	0.52	51.7	43.12
13	3811	1907	1904	943	0.54	53.9	70.73
14	3898	1961	1937	938	0.55	55.3	70.53
15	5873	2997	2876	1491	1.22	122.1	48.11
16	3993	2030	1963	1010	1.29	129.1	30.93
17	5396	2738	2658	1316	0.91	91.0	59.29
18	1103	573	530	252	0.60	59.5	18.53
19	6708	3470	3238	1546	0.45	44.6	150.29
<b>Jorhat Municipal Area</b>	<b>71782</b>	<b>37474</b>	<b>34308</b>	<b>17003</b>	<b>9.73</b>	<b>973.4</b>	<b>73.74</b>

Source: Census 2011/ Compilation by T&CP, Jorhat



Map 2.3 Population Density Map of JMB (Source: T&CP)

## 2.3 Sex Ratio

The sex ratio in Jorhat Municipal area was 916 and in Greater Jorhat Revised Master Plan area were 938 as per 2011 census, which is a little bit lower than the national average of 943.

Table 2.5 Sex Ratio of JMB and GJRMP area

Year	Population in JMB			Sex Ratio	Population in GJRMP			Sex Ratio
	Total	Male	Female		Total	Male	Female	
1951	16164	9872	6292	637	75729	42289	33440	791
1961	24953	15774	9179	582	99182	56746	42436	748
1971	30247	18348	11899	649	120863	67361	53502	794
1991	58358	32628	25730	789	183531	98703	84828	859
2001	67588	36502	31086	852	218899	115996	102903	887
2011	71782	37474	34308	916	245331	126571	118760	938

\*In 1981 Census was not held in Assam

Source: Census 2011

## 2.4 Literacy

The literacy rates in Jorhat Municipal area were 83 and in Greater Jorhat Revised Master Plan area were 81 as per 2011 census, the following table no. 4.1.5 shows that the male, female, total literacy of in Jorhat Municipal area and Jorhat Revised Master Plan area were found higher than the State and national average.

Table 2.6 Literacy Rate of JMB and GJRM area

Year	% of Literate Population in JMB			% of Literate Population in GJRM area		
	Total	Male	Female	Total	Male	Female
1951	62	63	39	22	33	10
1961	65	70	56	49	58	38
1971	65	68	61	57	64	49
1991	76	78	74	69	74	64
2001	80	82	78	77	81	73
2011	83	85	82	81	84	78

\*In 1981 Census was not held in Assam

Source: Census 2011

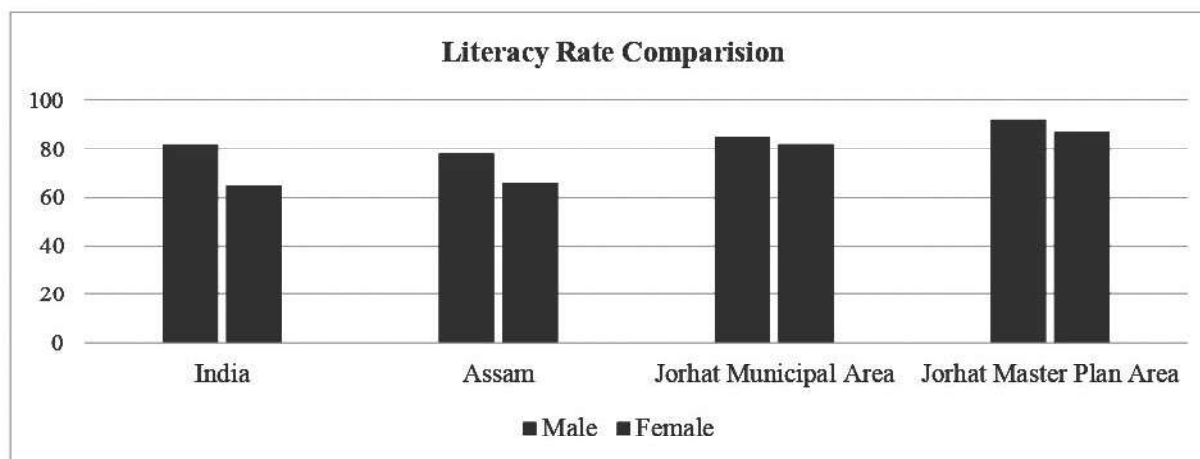


Chart 2.3 Comparison of Literacy Rate of GJRM area with India and Assam (Source: T&amp;CP)

## 2.5 Work Force

The Main workers are classified based on Industrial category of workers into the four categories, viz. Cultivators, Agricultural Laborers, Household Industry Workers and Other Workers.

Workers were categorized into main and marginal workers since 1981 census. Main Workers are those workers who had worked for the major part of the reference period i.e., 6 months or more. Marginal Workers are those workers who had not worked for the major part of the reference period i.e., less than 6 months.

Table 2.7 Workforce Participation in GJRM area

Area	Total	Male	Female	Main Worker %	Marginal Worker %
India (Total)	39.79	53.26	25.51	75.20	24.80
India (Urban)	35.31	53.76	15.40		
India (Rural)	41.80	53.00	30.00		
Assam (Total)	38.36	53.59	22.46	72.60	27.40
Assam (Urban)	36.41	56.79	14.90		
Assam (Rural)	38.70	53.10	23.70		
Jorhat GJRM (Total)	<b>40.13</b>	<b>58.38</b>	<b>20.69</b>	<b>79.67</b>	<b>20.33</b>
Jorhat GJRM (Urban)	39.89	60.44	17.45	84.90	15.10
Jorhat GJRM (Rural)	40.24	57.51	22.02	77.50	22.50

Source: Census 2011

## 2.6 Age-Sex Pyramid

The chart below depicts the age-sex pyramid of Jorhat. It shows that the age sex bottom heavy, that is there are a greater number of children and youth in the city. As the age goes up, it depicts there are a smaller number of old age population. The male to female ratio is also mostly linear with a slightly higher number of male populations.

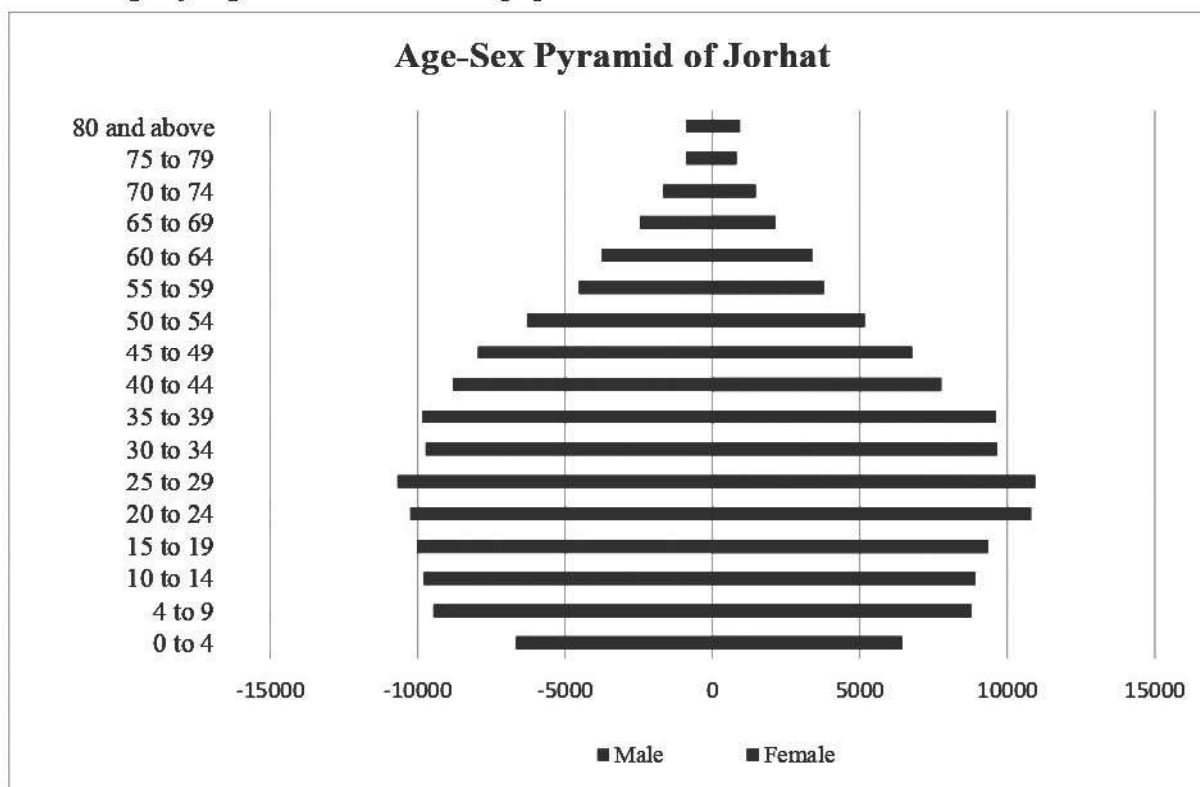


Chart 2.4 Age-Sex Pyramid of GJRMP area (Source: T&CP)

## 2.7 Population Projection

For all practical purposes, the size of the present and future population is a key input in an urban planning exercise. Since the last Census was conducted in 2011, population projection for the coming thirty years starting from 2011 has been calculated. In this exercise, the future population distribution is more than a mere population projection of the past trends or past behaviour of the demographic variables. Such allocation depends majorly on development programmes envisaged or decided upon in the respective areas. Thus, the ideal way to study

### 2.7.1 Population Projection Methods

#### 1. Arithmetic Increase Method

This method is based on the assumption that the population is increasing at a constant rate. The rate of change of population with time is constant. This method gives a low value and is suitable for well settled and established communities, and is generally applied to large and old cities with considerable development.

$$P_2 = P_1 (1 + r \cdot t)$$

$P_2$  = projected population,  $P_1$  = existing/initial population,  $r$  = rate of growth and  $t$  = duration (decadal/ yearly).



## 2. Geometric Increase Method

This method is based on the assumption that the percentage increase in population from decade to decade remains constant. In this method the average percentage of growth of last few decades is determined; the population forecasting is done on the basis that percentage increase per decade will be the same. Geometric mean of increase is used to find out the future increment in population. Since this method gives higher values and hence should only be applied for a new industrial town or young town at the beginning of development for only few decades.

$$P_n = P_o * (1 + r/100)^n$$

$P_n$  = Projected population,  $P_o$  = base year population,  $r$  = average decadal growth rate,  $n$  = number of decades.

## 3. Incremental Increase Method

This method is improvement over the above two methods. In this method the increment in arithmetical increase is determined from the past decades and the average of that increment is added to the average increase. This method increases the figures obtained by the arithmetical increase method. This method is suitable for an average size town under normal condition where the growth rate is found to be in increasing order.

$$P_n = P_o + (n * X) + (n * Y * (n + 1) / 2)$$

$P_n$  = projected population,  $P_o$  = existing population,  $X$  = first change,  $Y$  = Second change and  $t$  = duration (decadal/ yearly).

### 2.7.2 Population Projection for 2041

The population projection for the GJRM area calculated using all the three methods are given below. Geometric Progression Method as expected has given the highest value of 6,20,435, followed by incremental and arithmetic methods. The projection is calculated considering the population of 2011 as a base year.

The value calculated using the arithmetic method will be considered with an addition of 5,000 population for the intermediate year 2031, and a total population of 15,000 for the horizon year 2041. The justification for considering the lowest value and manually adding another population size is because to achieve an accurate projection, the latest population survey was required which could not be done due to the pandemic. Assam has faced a slow economic growth during the last few decades which has resulted in high out migration of local people. But this is not the scenario now and the Act East policy of Govt. has brought significant economic growth in the region in the last decade, but due to the absence of the latest Census, considering the incremental increase calculation method may not give desired results.

Table 2.8 Population Projection Results from different methods

Short Term, Medium Term and Long-Term Population Projection			
Type of Population Projection	Arithmetic Increase Method	Geometric Increase Method	Incremental Increase Method
2021	2,69,572	3,34,246	2,70,064
2031	2,93,814	4,55,388	2,95,290
2041	3,18,055	6,20,435	3,21,007

Source: Compilation by T&CP, Jorhat



This extra addition of population is considered as a result of the significant economic growth in the region, as well as migration from rural to urban areas. The population will be allocated in the 12 Outgrowths, which is considered as a Jorhat Agglomeration Area in the Census 2011, and the 6 Census Towns included in the Master Plan Area.

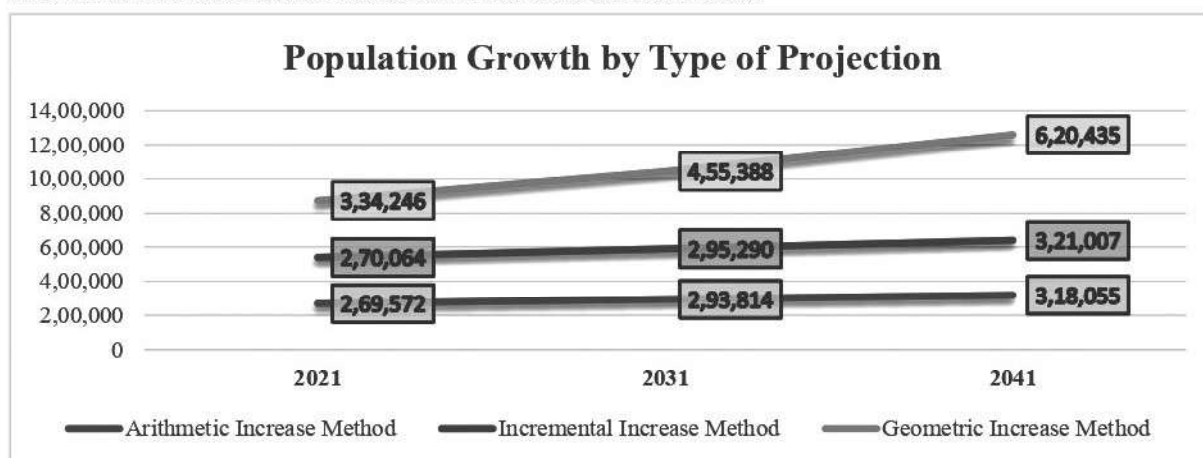


Chart 2.5 Population Growth Projected by different methods (Source: T&CP)

Table 2.9 Final Population Projection and Allocation for GJRMP area

Sl no	Greater Jorhat Revised Master Plan Area	Population (2011)	Percent	Population (2021)	Percent	Population (2031)	Percent	Population (2041)	Percent
1	Jorhat Municipal Area (Existing)	71782	29.26	79,727	29.58	87,673	29.34	95,618	28.71
2	12 Outgrowths (OG)	55350	22.56	60,427	22.42	68,504*	22.93	80,581**	24.19
3	6 Census Towns (CT)	36771	14.99	41,183	15.28	47,595*	15.93	55,007**	16.52
4	16 Villages in Jorhat East Circle	31348	12.78	33,802	12.54	36,257	12.13	38,711	11.62
5	19 Villages in Jorhat West Circle	41881	17.07	45,562	16.90	49,244	16.48	52,925	15.89
6	2 Villages in Teok Circle	2385	0.97	2,628	0.97	2,871	0.96	3,114	0.93
7	4 Villages in Mariani Circle	5814	2.37	6,242	2.32	6,670	2.23	7,098	2.13
	<b>Total</b>	<b>245331</b>	<b>100</b>	<b>269572</b>	<b>100</b>	<b>298814<sup>#</sup></b>	<b>100</b>	<b>333055<sup>#</sup></b>	<b>100</b>

\*3000 Population and 2000 population added to the projected values in 12 Outgrowths and 6 Census Towns respectively in the year 2031.

\*\*10000 Population and 5000 population added to the projected values in 12 Outgrowths and 6 Census Towns respectively in the year 2041.

# A total of 5000 populations are added to the calculated value in the year 2031, and a total of 15000 population is added to the projected value in the year 2041.

Source: Compilation by T&CP, Jorhat

Therefore, the total population projected for the year 2041 is 3,33,055 and the population projected for the intermediate year 2031 is 2,98,814.

## Chapter 3: Economic Base and Employment

The economy of Jorhat is mainly based on agriculture. The core field crop of the district is rice, with per capita food grain production of 205 kg per annum. The district has a number of small scale and cottage industries of cane work and bamboo work, silver jewellery, furniture making, brass smithy, umbrella making, soap manufacturing, packaged food manufacturing, etc. The district also has the headquarters of ONGC East India and Assam Arakan Basin. In the year 2018-19 the gross domestic product in the district was ₹ 10,36,400 lakhs at current price and ₹ 7,84,729 lakhs at constant prices in the year 2011-2012. The net domestic product in the district during the period 2007-08 was ₹ 3,17,309 lakhs at current price and ₹ 2,45,456 lakhs at constant prices in the year 1999-2000. The Per Capita Income or NDDP, At Factor Cost during the period 2018-19 was ₹ 1,27,137 at current price and ₹ 95,643 at constant prices in the year 2011-2012.

### 3.1 Formal Sector

#### 3.1.1 Primary Activities

##### 3.1.1.1 Agriculture

The diminishing importance of agricultural activities can be demonstrated through two major events – the reducing contribution of agriculture in the NSDP, and the waning participation of the local workforce in agricultural and allied activities. The age-old farming techniques are not helping the cause of the farmers in terms of yield of crops. As per 2011 census only 2.44 per cent of the total workers were engaged in primary sector, in Jorhat Municipal Area and its outgrowth; but in the planning area, excluding urban area, it was 15.90%.

**Agricultural area in Villages (excluding Municipal Area, Census Towns, and Outgrowths)**

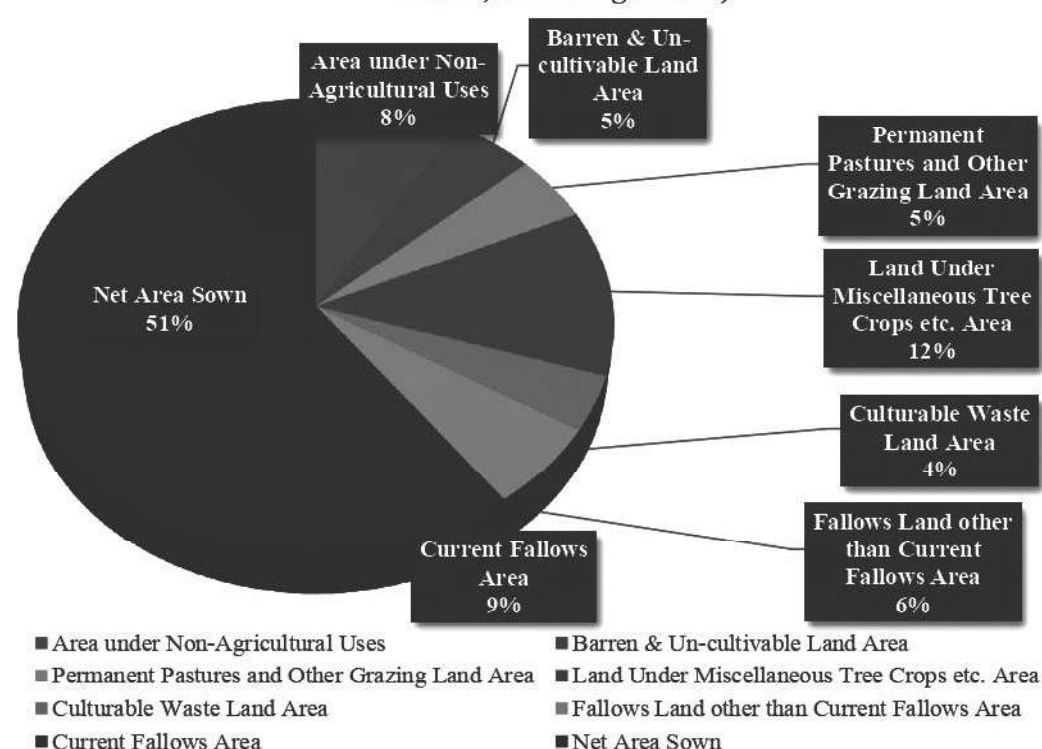


Chart 3.1 Agricultural area in Villages (Source: Census 2011, compiled by T&CP, Jorhat)

Table 3.1 Agricultural Production in GJRMF area

Sl. No.	Name of Crops	Production (MT)
1.	Paddy	15,404.70
2.	Mustard	67.00
3.	Horticulture	148.59
4.	Vegetable	5,677.70

Source: Deptt. of Agriculture, (Jorhat), 2018

### 3.1.1.2 Livestock, Animal Husbandry, and Pisciculture

This sector has seen phenomenal growth in few years as there is huge demand for all livestock and animal husbandry products within the region. Dairy products also have a readymade market and the daily produce does not need any marketing or agency to be sold off. Increased impetus can be provided in this sector by creating a dairy processing outside the JMB by properly processing and marketing the products.

There is also a huge potential for pisciculture, modern pisciculture techniques can be adopted and the sector organized to increase the yield and produce abundantly not just for the region but beyond it.

### 3.1.1.3 Tea

Jorhat has many tea gardens which are historically more than 100 years old, and the oldest tea garden of India – Cinnamara Tea Estate is situated in Jorhat.

## 3.1.2 Secondary Activities

### 3.1.2.1 Industries

Manufacturing units found in the planning area are steel fabrication units, furniture making units. The construction units found in the planning area are civil construction units. The following Table 3.2 shows the industrial establishment by type in the Revised Master Plan area for greater Jorhat. It is seen Food and Allied sector industries are established in the Master Plan area.

Table 3.2 Industrial Establishments in GJRMF area by type

Sl. No.	Type	No. of Units
1.	Micro Industries	
	Food Processing	22 nos.
	Soft Drinks	1 no.
	Wood based	4 no.
	Paper products	1 no.
	Mineral based	3 nos.
	Chemical based	9 nos.
	Blacksmithy	9 nos.
	Other manufacturing activities	63 nos.
	Other service activities	32 nos.
		144
2.	Small Industries	
	Food Processing	16 nos.
	Paper products	2 nos.
	Other manufacturing activities	21 nos.
	Other service activities	16 nos.
		55
3.	Medium Industries	

	Wood based	1 no.	2
	Other service activities	1 no.	

Source: DICCC, Jorhat, 2018

Though there are no large industries in Jorhat, there are 2 nos. medium and 55 nos. small industries in the whole planning area viz. Gattani Ply etc., within Jorhat Municipality, there are 61 nos. micro, 25 nos. small and 1 no. medium industries. Cinnamora Village has as many as 29 nos. of micro, 9 nos. of small and 1 no. of medium industry; Kamar Hazarika Gaon has 9 nos. of micro industry and Sarbaibandha has 5 nos. of micro industry. Kathkotia Gaon, Katoni Gaon and Chiringia Gaon has 3, 4, 1 no. of micro and 3 nos. each of small industry respectively. District Industries Centre, Jorhat has an industrial estate at Cinnamora. Cane work and bamboo work, silver jewelry, furniture making, brass smithing, umbrella making, soap manufacturing, packaged food manufacturing etc.

### 3.1.2.2 Trade and Commerce

Commercial establishment in the planning area may be divided into 4 board categories viz. wholesale, wholesale cum Retail Sale, Retail Sale, Service shops. An Industrial Areas is located at Cinnamora having an area of 34788.0 Sq.m. having 29 nos. of shed, out of which 24 nos. of shed have been allotted till date.

The wholesale trading is mostly concentrated in and around the CBD of Jorhat town. Wholesale cloth Market, Hardware market, food and food staff market are located in the CBD area of Jorhat Town. The wholesale vegetable market is located along New Vill Road. Also, weekly markets at neighboring, village like Rowriah, Nowsolia etc., serve as wholesale market. The following **Table 3.3** shows the villages having Weekly/ Daily markets in the planning Area outside Jorhat Municipal Plan Area.

Table 3.3 Daily / Weekly / Bi-Weekly Market in The Planning Area

Sl. No.	VILLAGE	Daily/Weekly
1.	Rowriah	Daily & weekly on Sunday
2.	Nowsolia	Weekly on Saturday
3.	Lohpohia (Hatigarh)	Weekly on Sunday
4.	Borbheta Chariali	Daily
5.	Lichubari	Daily
6.	MES Gate	Weekly on Wednesday
7.	Dohabora Chuk road	Daily
8.	Lahoty JEC Road	Weekly on Sunday
9.	Chinnamora	Daily

Source: Field Survey, T&CP, Jorhat.

The CBD area is the main center for retail trade and commercial activity for Jorhat Town and for the whole planning area. It also serves as wholesale market for the nearby towns and rural centers and parts of Nagaland. The other shopping areas presently functions within Greater Jorhat Master Plan Area are A.T. Road, JB Road, KB Road within municipal limit and Cinnamora, Borbheta, Rowriah, Bamun Gaon, Ajanta Bye pass point outside the municipal area. A study of growth of shops and commercial establishment in Jorhat Town has shown that it has been increased by 44% from 6523 nos. in 2001 to 9413 nos. in 2011. (Field Survey, T&CP, Jorhat)

The CBD area of Jorhat Town is getting congested with the function of wholesale trade and ware housing along narrow roads, due to the shortage of space. It is necessary that these functions of trade and transport agencies be provided with more space at better location.

On the other hand, some parts of JB road, Newville Road, Old circuit house road and A.T. road are used by roadside vendors which hamper the normal traffic flow of those areas and leads to traffic congestion. So, it is necessary to locate some areas in CBD as vendors zone to minimize the above problems.

### **3.1.2.3 Household Industries**

The Household industries found in the planning area are, mainly food and beverages production units, weaving, embroidery, cutting & tailoring, wood and bamboo works, paper plate and glass manufacturers, etc. Many members of Self-Help Groups (SHGs) and homemakers are engaged in the household industries.

### **3.1.3 Tertiary Activities**

#### **3.1.3.1 Transportation**

The size of this sector is moderately high in the master plan area. Logistics and allied activities have tremendous potential in the city both in terms of passenger and freight traffic movement. The development of road linkages to other important urban destinations and within the region can provide impetus to this sector.

There is altogether a good number of registered transport vehicles currently in running condition. Regional connectivity is mostly depended on the mini buses, maxi cabs operating in the city. A large number of construction equipment vehicles are also operating in the area due to ongoing development works in the region. Service centres, and auto shops are coming up in the city in large numbers. Thus, the workers engaged in transport sector are quite high in the planning area.

#### **3.1.3.2 Public Administration**

Though Jorhat has to function as divisional and district head-quarter, there are all district level offices established at the town. Circle level offices are also located at Jorhat. The head-quarter of Upper Assam Division (Civil) is also located at Jorhat. The presence of administrative offices and the Jorhat District Court provide direct and indirect employment to many people here.

#### **3.1.3.3 Banking and Finance Institutions**

This sector has immense potential in providing employment particularly keeping in mind the craze of local people for white collared jobs. Private players in banking and financial organizations can be attracted to set up establishments in Jorhat, to cater to the State and Central Government employees and trade and commerce in the region, provided they possess a valid RBI license.

#### **3.1.3.4 Educational Institutes**

Also known as education hub of the state, Jorhat has a large number of educational institutes situated in the planning area. Institutions like Assam Agricultural University, Women Central University, Regional Research Laboratory, National Institute of Design, Rain Forest Institute, Jorhat Engineering College, JIST, Jorhat Medical College, POWIET are employed with many local peoples.

#### **3.1.3.5 Defence and PSUs**

Jorhat Air Force Station (10 Wing AFS), Army Campus, Assam Rifles, CRPF camp, Military Engineering Services, are present in the planning area, which provides indirect employments to the local peoples. Apart from that ONGC Assam Arkan basin Head quarter, Oil India



pumping station are also located in the planning area, which provides many direct and indirect employments.

### 3.1.3.6 Real Estate

The real estate sector is rising in the core areas of the Jorhat Master Plan Area; however, there is always a rising demand due to growing job opportunities and in migration it causes. The housing needs in the region can only be catered by creating new spines of development; this can be triggered by creating new linkages connecting the city to adjoining hinterland. Migration of labour workforce has necessitated the need of low-cost housing in the region and this is needed to be addressed to prevent growth of slums and squatter settlements.

## 3.2 Informal Sector

Informal sector trade and commercial activities are generally seen in all the urban centers of the state. Jorhat Town is also not exception in this respect. Roadside retail shops are found here and there in the municipal area as well as in the planning area especially in the villages near the town. Informal transport has been seen in the form of slow-moving vehicles only. A large number of rickshaws, thellas, penycarts etc. are playing in the planning area without license. Few household industries are running in the planning area without registration. Weaving, cutting and tailoring, embroidering, doll-making, agarbati making food related items etc. are some of these kinds of industries found in the planning area. This informal sector business has been increasing because of urban poverty. Urban poor mainly depend on this type of informal business to day-to-day earnings.

## 3.3 Employment

### 3.3.1 Occupational Pattern

The working participation of the planning areas of Jorhat was analyzed from the Census 2011, and the result is given in **Table 3.4** below.

*Table 3.4 Total Workers and the Workforce Participation Rate in GJRMP area*

Sl no.	Greater Jorhat Revised Master Plan Area	Total Workers			Workforce Participation Rate		
		Total	Male	Female	Total	Male	Female
1	Jorhat Municipal Area (Existing)	28635	22648	5987	0.40	0.60	0.17
2	12 Outgrowths (OG)	21157	16062	5995	0.38	0.57	0.22
3	6 Census Towns (CT)	14732	11202	3530	0.40	0.59	0.20
4	16 Villages in Jorhat East Circle	12233	8760	3473	0.39	0.55	0.23
5	19 Villages in Jorhat West Circle	17062	12904	4158	0.41	0.60	0.21
6	2 Villages in Teok Circle	635	504	131	0.27	0.42	0.11
7	4 Villages in Mariani Circle	2958	1890	1068	0.51	0.64	0.37
	<b>Total</b>	<b>97412</b>	<b>73970</b>	<b>24342</b>	<b>0.40</b>	<b>0.58</b>	<b>0.20</b>

Source: Census 2011; Compilation by T&CP, Jorhat

## Chapter 4: Housing and Shelter

Shelter is one of the basic human needs and its condition deeply affects the character of human life. As housing constitutes the largest land-use element in a town, it makes significant impact on its proper functioning and urban form. The existing status of housing in Jorhat is influenced by the urbanization, the breaking up of joint families to nuclear ones, and the subsequent increase in the demand for housing.

The growth of housing in Jorhat is undulating in nature, and much of the growth is seen in the outgrowths than in the municipal areas. Also, with increasing prices of land, the growth happens in the periphery areas where land price is less comparatively. They are encroaching upon vital virgin lands and steep slopes. As the house is a significant element of built environment, it has to be viewed as a planned, functional, secure and aesthetic entity.

Jorhat falls under earthquake zone V, and an active flood prone area. It is observed that majority of the old structures does not oblige the NBC building norms and guidelines. It is a matter of great concern and it is advised that all future construction should take the bylaws and guidelines. It is also recommended that existing buildings shall be upgraded to meet the modern standards and requirements. The gap of preparing a master plan for the city for 30 years has created an urban sprawl that has grown haphazardly.

### 4.1 Existing Housing Scenario

Homelessness is not a major problem in Jorhat. Nevertheless, there has been a rapid increase in the demand for housing due to the large scale in-migration, as well as the breaking up of extended families. There are some slum pockets declared by the government. These pockets need to be closely studied and environmental improvement projects need to be taken up. The traditional assam type style of construction is getting lost and often the new construction lacks any definite character. A hybrid style has developed over time.

#### 4.1.1 Households in Greater Jorhat Revised Master Plan Area

The **Table 4.1** below depicts the number of households in the planning area and the housing size. 67.8% of the households are in the urban area, while the rest are in the rural areas. The overall housing size in the planning area is 4.3.

*Table 4.1 Households and Housing size in GJRM area*

Sl no.	Greater Jorhat Revised Master Plan Area	Population (2011)	No. of Households	Housing Size
1	Jorhat Municipal Area (Existing)	71782	17003	4.2
2	12 Outgrowths (OG)	55350	13178	4.2
3	6 Census Towns (CT)	36771	8326	4.4
4	16 Villages in Jorhat East Circle	31348	6985	4.5
5	19 Villages in Jorhat West Circle	41881	9369	4.5
6	2 Villages in Teok Circle	2385	547	4.4
7	4 Villages in Mariani Circle	5814	1337	4.3
	<b>Total</b>	<b>245331</b>	<b>56745</b>	<b>4.3</b>

*Source: Census 2011/Compilation by T&CP, Jorhat*

**4.1.1.1 Households in Jorhat Municipal Area***Table 4.2 Housing Scenario in Municipal Wards of JMB*

Ward no.	Population (2011)	No. of Households	Housing Size
1	6275	1511	4.2
2	5412	1320	4.1
3	4196	1159	3.6
4	4722	886	5.3
5	2860	666	4.3
6	3242	602	5.4
7	3405	702	4.9
8	2214	474	4.7
9	2795	682	4.1
10	2127	547	3.9
11	1523	390	3.9
12	2229	568	3.9
13	3811	943	4.0
14	3898	938	4.2
15	5873	1491	3.9
16	3993	1010	4.0
17	5396	1316	4.1
18	1103	252	4.4
19	6708	1546	4.3
<b>Jorhat Municipal Area</b>	<b>71782</b>	<b>17003</b>	<b>4.2</b>

Source: Census 2011/Compilation by T&CP, Jorhat

**4.1.2 Housing Condition**

According to the Census of 2011, 54.4 % Houses are in good condition, 40.9 % Houses are in livable condition, and only 4.7% Houses were in dilapidated condition in GJRMP Area. The Outgrowths have the highest percentage and number of dilapidated households. This condition however has improved till date with renovation and renewal projects going on in several locations.

*Table 4.3 Livable Condition of Houses in GJRMP area*

Sl no.	Greater Jorhat Revised Master Plan Area	No. of Households	Total		
			Good	Livable	Dilapidated
1	Jorhat Municipal Area (Existing)	17,003	12,412	4,183	408
2	12 Outgrowths (OG)	13,178	7,446	5,074	659
3	6 Census Towns (CT)	8,326	5,096	2,956	275
4	16 Villages in Jorhat East Circle	6,985	4,282	2,424	279
5	19 Villages in Jorhat West Circle	9,369	5,453	3,560	356
6	2 Villages in Teok Circle	547	181	288	79
7	4 Villages in Mariani Circle	1,337	505	829	3
	<b>Total</b>	<b>56,745</b>	<b>30,869</b>	<b>23,209</b>	<b>2,667</b>

Source: Census 2011



### 4.1.3 Housing Structure

The structural conditions of houses are classified on the basis of material used for wall and roof. Of the total houses 56,745 in the planning area per census of India, 2011 the different type of houses in Jorhat Municipal Area and Revised Master Plan Area for Greater Jorhat are shown in the table below.

#### 4.1.3.1 Materials of Roof

The **Table 4.4** below depicts the materials of roof in the houses of the planning area as per Census 2011. Most of the houses have G.I sheets as a roof material (84.1%), because it provides protection against rain and it is also easily available in the area. And around 8.6% of the houses have concrete roofs as per the Census of 2011.

Table 4.4 Materials of Roof in the houses of GJRMF area

Sl no.	Greater Jorhat Revised Master Plan Area	No. of Households	Material of Roof (in percent)								
			Grass/ Thatch/ Bamboo/ Wood/Mud etc.	Plastic/ Polythene	Handmade Tiles	Machine made Tiles	Burnt Brick	Stone/ Slate	G.I./Metal/ Asbestos sheets	Concrete	Any other material
1	Jorhat Municipal Area (Existing)	17,003	0.9	0.1	0.7	0.5	0.4	3.4	63.8	29.9	0.4
2	12 Outgrowths (OG)	13,178	1.8	0.1	0.5	0.2	0.1	2.8	84.0	10.0	0.3
3	6 Census Towns (CT)	8,326	2.7	0.1	0.8	0.1	0.2	3.3	85.3	7.6	0.1
4	16 Villages in Jorhat East Circle	6,985	1.7	0.1	0.7	0.1	0.1	1.0	93.0	3.2	0.1
5	19 Villages in Jorhat West Circle	9,369	1.8	0.2	1.0	0.0	0.2	1.8	91.5	3.4	0.1
6	2 Villages in Teok Circle	547	12.1	0.0	2.4	0.0	0.8	2.1	79.3	3.1	0.2
7	4 Villages in Mariani Circle	1,337	2.8	0.1	1.2	0.0	0.6	0.7	91.9	2.8	0.1
	<b>Total</b>	<b>56,745</b>	<b>3.4</b>	<b>0.1</b>	<b>1.0</b>	<b>0.1</b>	<b>0.3</b>	<b>2.1</b>	<b>84.1</b>	<b>8.6</b>	<b>0.2</b>

Source: Census 2011

#### 4.1.3.2 Materials of Wall

The **Table 4.5** below depicts the materials of wall in the houses of the planning area as per Census 2011. Most of the houses have burnt bricks (46.5%) as wall materials, followed by bamboo walls (around 40.9%). This numbers may have change with increasing number of houses with brick walls, because of more permanent in nature and easy availability.

Table 4.5 Materials of Wall in the houses of GJRMF area

Sl no.	Greater Jorhat Revised Master Plan Area	No. of Households	Material of Wall (in percent)								
			Grass/ Thatch/ Bamboo etc.	Plastic/ Polythene	Mud/ Unburnt brick	Wood	Stone not packed with mortar	Stone packed with mortar	G.I./ Metal/ Asbestos sheets	Burnt brick	Concrete

1	Jorhat Municipal Area (Existing)	17,003	20.8	0.5	2.9	0.4	1.2	9.6	1.1	58.9	4.2	0.6
2	12 Outgrowths (OG)	13,178	36.4	0.3	3.3	0.9	0.9	4.2	0.2	50.1	3.3	0.2
3	6 Census Towns (CT)	8,326	36.9	0.4	3.8	0.2	1.2	4.4	0.2	48.1	4.8	0.0
4	16 Villages in Jorhat East Circle	6,985	41.3	0.2	3.3	0.0	0.6	3.2	0.1	49.3	1.8	0.2
5	19 Villages in Jorhat West Circle	9,369	43.7	1.4	4.5	0.3	1.0	2.6	0.2	43.3	2.9	0.2
6	2 Villages in Teok Circle	547	60.9	0.0	0.8	0.0	0.7	1.9	0.0	35.8	0.0	0.0
7	4 Villages in Mariani Circle	1,337	46.4	2.1	9.1	0.1	0.1	0.1	0.0	39.9	2.2	0.1
	<b>Total</b>	<b>56,745</b>	<b>40.9</b>	<b>0.7</b>	<b>4.0</b>	<b>0.3</b>	<b>0.8</b>	<b>3.7</b>	<b>0.2</b>	<b>46.5</b>	<b>2.7</b>	<b>0.2</b>

Source: Census 2011

#### 4.1.3.3 Materials of Floor

The **Table 4.6** below depicts the materials of floor in the houses of the planning area as per Census 2011. Majority of the houses have mud flooring (51.5%), followed by concrete flooring (38.7%). This numbers however may have changed now, and the number of houses with concrete flooring may have increased.

Table 4.6 Materials of Floor in the houses of GJRMP area

Sl no.	Greater Jorhat Revised Master Plan Area	No. of Households	Material of Floor (in percent)						
			Mud	Wood/Bamboo	Burnt Brick	Stone	Cement	Mosaic/Floor tiles	Any other material
1	Jorhat Municipal Area (Existing)	17,003	19.5	0.3	4.9	1.0	60.0	14.0	0.3
2	12 Outgrowths (OG)	13,178	44.2	0.2	4.3	0.6	42.6	7.9	0.2
3	6 Census Towns (CT)	8,326	43.1	0.3	3.9	2.9	41.3	8.4	0.3
4	16 Villages in Jorhat East Circle	6,985	58.2	0.1	1.2	2.6	34.3	3.5	0.0
5	19 Villages in Jorhat West Circle	9,369	57.0	0.1	3.9	0.4	35.7	2.9	0.0
6	2 Villages in Teok Circle	547	75.4	0.2	0.4	0.2	22.6	1.3	0.0
7	4 Villages in Mariani Circle	1,337	63.3	0.0	0.4	0.2	34.7	1.0	0.4
	<b>Total</b>	<b>56,745</b>	<b>51.5</b>	<b>0.1</b>	<b>2.7</b>	<b>1.1</b>	<b>38.7</b>	<b>5.6</b>	<b>0.2</b>

Source: Census 2011

#### 4.1.4 Housing Density

Cities in India tend to have highest housing density in the central area. The density often progressively falls towards outskirts of the city this phenomenon is produced by intermixing of land uses in the central area particularly commercial activities, with residences. Housing density is defined as the average number of houses in one square kilometer of land or total number of households per total area. The housing density is important to be studied in urban study because it describes the level of openness or congestion in an area in terms of built-up area and open areas with respect to total area. Analysis of housing density in GJRMP area has revealed the overall gross housing density as 362. The high housing density in JMB area is not a reflection of high-rise building but it is essentially due to the high occupancy rate and land coverage.

**4.1.4.1 Housing Density in Jorhat Municipal Area**

The **Table 4.7** below depicts the ward wise comparison of the housing density in Jorhat Municipal Area. Ward no. 4 has the highest housing density of 10,237.4 hh/sq.km, followed by Ward no. 2 and Ward no. 7 with a density of 6146.3 hh/sq.km and 5735.5 hh/sq.km respectively.

*Table 4.7 Housing Density in Municipal Wards of GJRM area*

Ward no.	No. of Households	Area (in sq.km)	Area (in Hectare)	Housing Density (per sq.km)
1	1511	0.61	61.0	2477.9
2	1320	0.21	21.5	6146.3
3	1159	0.28	27.6	4200.6
4	886	0.09	8.7	10237.4
5	666	0.34	34.4	1937.0
6	602	0.12	12.2	2814.2
7	702	0.21	21.4	5735.5
8	474	0.26	26.1	1815.0
9	682	0.27	26.9	2536.7
10	547	1.00	99.9	547.4
11	390	0.27	26.6	1467.4
12	568	0.52	51.7	1098.8
13	943	0.54	53.9	1750.1
14	938	0.55	55.3	1697.1
15	1491	1.22	122.1	1221.3
16	1010	1.29	129.1	782.4
17	1316	0.91	91.0	1445.9
18	252	0.60	59.5	423.4
19	1546	0.45	44.6	3463.7
<b>Jorhat Municipal Area</b>	<b>17003</b>	<b>9.73</b>	<b>973.4</b>	<b>1746.8</b>

*Source: Census 2011/Compilation by T&CP, Jorhat*

**4.1.4.2 Housing Density in Greater Jorhat Revised Master Plan Area**

The **Table 4.8** below depicts the housing density in the whole planning area, with the highest density in the JMB area as expected.

*Table 4.8 Housing Density in GJRM area*

Sl no.	Greater Jorhat Revised Master Plan Area	No. of Households	Area (in sq.km)	Housing Density (per sq.km)
1	Jorhat Municipal Area (Existing)	17003	9.73	1746.8
2	12 Outgrowths (OG)	13178	39.47	333.89
3	6 Census Towns (CT)	8326	14.26	584.05
4	16 Villages in Jorhat East Circle	6985	37.22	187.69
5	19 Villages in Jorhat West Circle	9369	44.34	211.32
6	2 Villages in Teok Circle	547	4.31	127.01
7	4 Villages in Mariani Circle	1337	7.43	179.98
	<b>Total</b>	<b>56745</b>	<b>156.74</b>	<b>362.0</b>

*Source: Compilation by T&CP, Jorhat*

#### 4.1.5 Ownership Scenario of Houses

According to census 2011, the housing sizes are classified as number of dwelling units with following categories - Dwelling units with no exclusive rooms; Dwelling units with single room; Dwelling units with two and three rooms; Dwelling units with four and five rooms; and Dwelling units with six and above rooms.

The **Table 4.9** given below depicts the ownership status of the households of the planning area. 76.4% of the total houses are owned, while the rest are not. The table also depicts the houses with number of dwelling units, majority of the houses (64.7%) have at least two to four rooms, while a 24.1% of the households have more than four rooms. The houses in urban areas are much compact with mostly two to three rooms, while the houses in rural areas are larger with a greater number of rooms.

Table 4.9 Ownership Scenario of Houses in GJRM area

Sl no.	Greater Jorhat Revised Master Plan Area	Ownership Status			Number of Dwelling Rooms						
		Owned	Rented	Any Other	No exclusive	One room	Two rooms	Three rooms	Four rooms	Five rooms	Six rooms and above
1	Jorhat Municipal Area (Existing)	50.5	44.0	5.6	1.5	18.8	21.3	18.9	16.3	11.3	11.9
2	12 Outgrowths (OG)	70.1	22.8	7.2	0.9	13.2	23.9	19.9	17.9	12.5	11.8
3	6 Census Towns (CT)	74.8	21.6	3.6	0.7	9.0	21.8	24.3	17.4	12.5	14.4
4	16 Villages in Jorhat East Circle	94.4	3.5	2.1	0.5	8.0	24.6	24.2	19.9	11.1	11.7
5	19 Villages in Jorhat West Circle	86.2	8.6	5.2	0.7	6.5	19.1	23.2	23.9	13.3	13.3
6	2 Villages in Teok Circle	75.9	1.5	22.6	1.3	6.5	26.3	26.1	23.0	6.5	10.5
7	4 Villages in Mariani Circle	82.8	15.5	1.7	0.5	9.7	16.9	19.1	25.2	14.4	14.1
	<b>Total</b>	<b>76.4</b>	<b>16.8</b>	<b>6.8</b>	<b>0.9</b>	<b>10.2</b>	<b>22.0</b>	<b>22.2</b>	<b>20.5</b>	<b>11.6</b>	<b>12.5</b>

Source: Census 2011

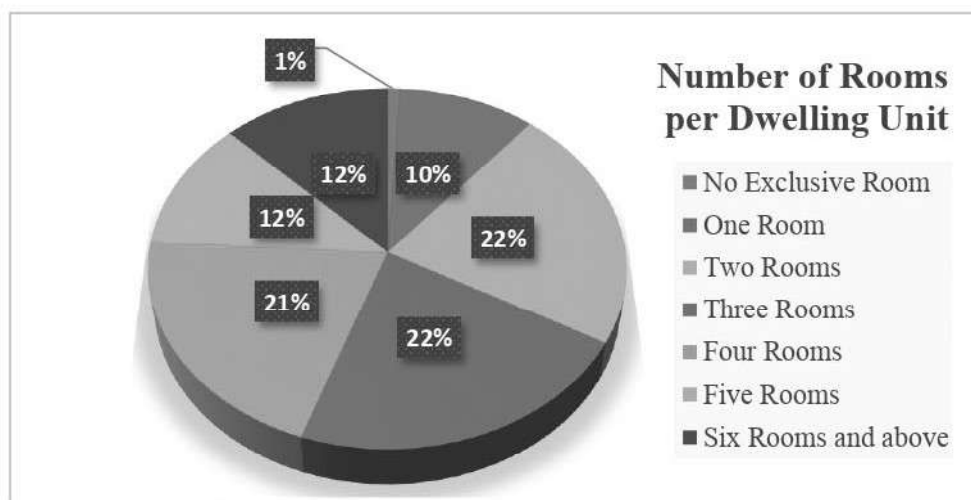


Chart 4.1 Number of dwelling rooms per house in GJRM area (Source: T&CP)

#### 4.1.6 Slums In Jorhat

Slums are a common phenomenon in urban areas. Urban slums represent the lowest sections of people in urban society. They are the medley of all that is considered worst about the human situation-filth, pollution, disease and misery etc. Most of such environmental hazards exert a direct or indirect effect on the health and well-being of urban dwellers.

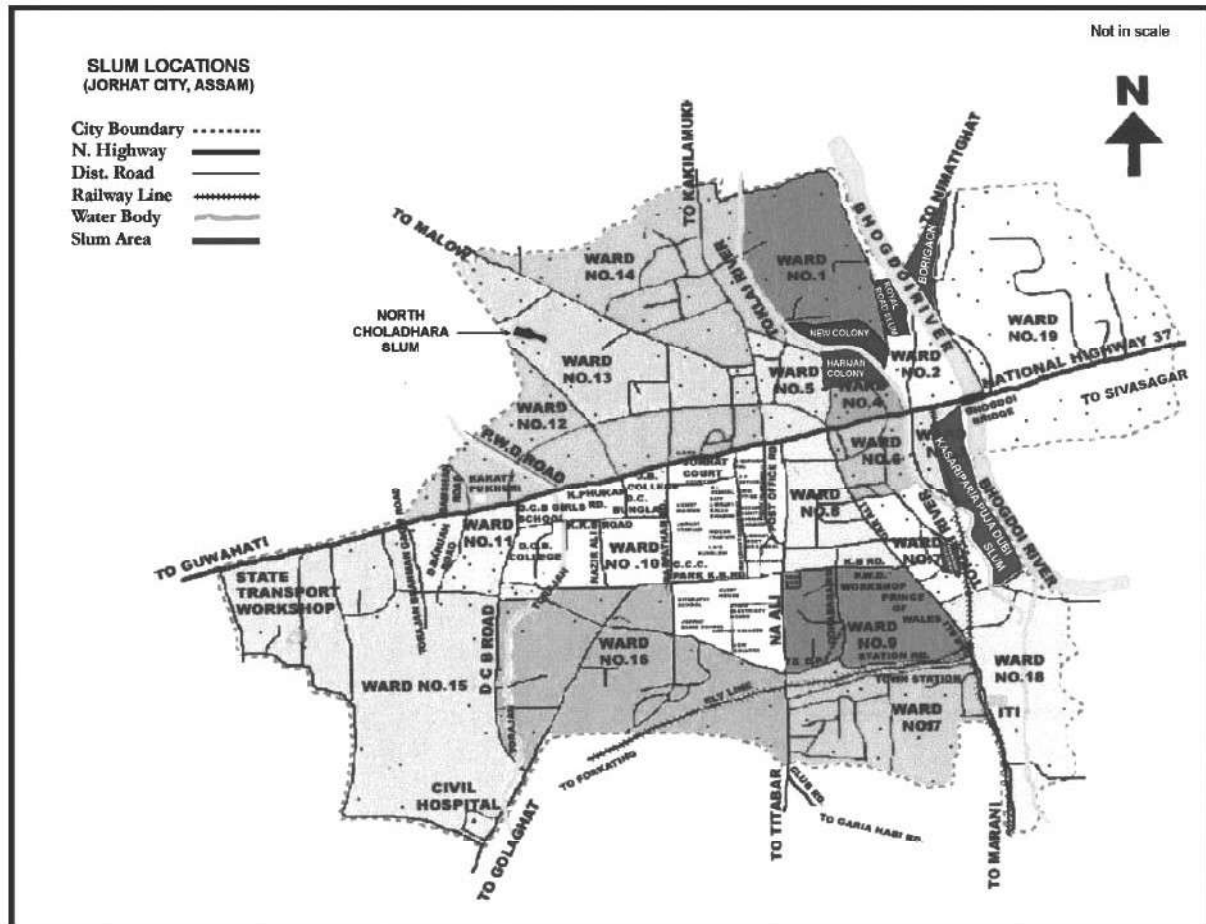
It has been a well-known fact that people in slum areas live under the most deplorable socio-economic and health conditions. The housing conditions of the people living in the slum areas are in deplorable condition. There are altogether 19 number of Identified slum pockets in Jorhat Municipal Area. The housing condition of Horizon Colony and other slum areas need immediate attention. Slums in the city are deplorable of good source of water, and sanitation facilities.

Table 4.10 Summary of Slums in the GJRMF area

Notified Slums							
Sl. No.	Name of the Slum	Ownership of land where Slum is located*	Area in sq. Kms	Slum population	No. of Slum Households	BPL Population	No. of BPL Households
1	Rajamoidam New Colony	04	0.352	2008	490	175	64
2	Royal Road	05	0.22	1933	441	286	58
3	Kachariparia Pujadubi	01	0.45	2466	590	104	24
4	Harijan Colony Dhakaiputty	04	0.3	2550	544	403	92
5	Borigaon	04	0.41	1461	301	105	23
Total			1.73	10418	2366	1073	261
Non-Notified Slums							
Sl. No.	Name of the Slum	Ownership of land where Slum is located*	Area in sq. Kms	Slum population	No. of Slum Households	BPL Population	No. of BPL Households
1	North Cholahdara	04	0.066	112	23	22	4
Total	-	-	0.066	112	23	22	4
Grand Total	-	-	1.8	10530	2389	1095	265

\*(Public: Local Body – 01, State Govt. – 02, Central Govt. – 03, Private – 04, Other – 05)

Source: USHA Survey, T&CP, Jorhat



Map 4.1 Map of Jorhat showing slum pockets (Source: JMB)

## 4.2 Estimation of Housing Requirements

The future housing requirement for the GJRMP area has been assessed considering both, the quantitative housing shortage and the qualitative housing shortage. The future household formation, including natural growth and in-migration have been considered, the current housing backlog as well the obsolescence component, have also been considered.

### Factors

There are several factors which would affect the housing shortage. The recent technique in finding the housing shortage is published by Ministry of Housing and Urban Affairs and alleviation. There are 5 major factors which decides the housing shortage in the system. They are:

1. Congestion factors
2. Obsolescence factors
3. Non-Durability
4. Present housing shortage
5. Calculation of housing shortage for 2041 for the projected population



*Congestion Factor*

Congestion factor is the ratio of households that are residing in unacceptable congested conditions, from physical and socio-cultural viewpoints (i.e., married couples sharing the room with other adults etc.) or the percentage of households in which each married couple does not have separate room to live.

As per Census 2011, It is observed that the planning area shows negligible or no congestion factor for all the Municipalities/ communes in Jorhat Master Plan Area for the year 2011. Slum neighborhoods has the highest congestion factor as per survey. A congestion factor of 1.0% is considered for the planning area.

*Obsolescence Factor*

Obsolescence factors is the ratio of all the bad houses, excluding those that are less than 40 years old and all houses' ages 80 years or more. Obsolescence are the households living in obsolete buildings (40 to 80 years old in a bad structural condition, and 80 or more years) and excluding temporary houses (to avoid double counting). Dilapidated houses accounts for 4.7% of total housing stock for the planning area and 3.5% for the urban areas, while 40.9% are livable in the total planning area and 32.8% for urban areas.

20% of the households in the planning area may need replacement or upgradation, out of which 5% of the total households will require total replacement while the rest will be upgraded.

*Non-Durability*

Non-durability is the no. of temporary houses which are not suitable for living or non-serviceable units are taken out. Temporary/ kutchra houses are those in which both the walls and roof are made of materials that need to be replaced frequently. As per the census definition, temporary houses are made with walls and roofs made of temporary material. Walls can be made of grass, thatch, bamboo, plastic, polythene, mud, unburnt bricks or wood. Roofs can be made of grass, thatch, bamboo, wood, mud, plastic or polythene. Hence the non-durability of housing is the difference between the number of housing stock to the number of permanent houses.

The **Table 4.11** represents the details of permanent, semi-permanent house and temporary house within the GJRMP Area. As per the Census of 2011, a total of 3.2% of households are temporary in nature and may need upgradation.

*Table 4.11 Durability of Houses in GJRMP area*

Sl no.	Greater Jorhat Revised Master Plan Area	No. of Households	Type of Housing		
			Permanent	Semi-Permanent	Temporary
1	Jorhat Municipal Area (Existing)	17,003	74.4	24.1	0.7
2	12 Outgrowths (OG)	13,178	58.3	39.6	1.6
3	6 Census Towns (CT)	8,326	58.4	39.0	2.6
4	16 Villages in Jorhat East Circle	6,985	54.7	43.5	1.5
5	19 Villages in Jorhat West Circle	9,369	49.7	48.4	1.7
6	2 Villages in Teok Circle	547	38.0	50.2	11.7
7	4 Villages in Mariani Circle	1,337	42.2	55.1	2.7
	<b>Total</b>	<b>56,745</b>	<b>53.7</b>	<b>42.8</b>	<b>3.2</b>

Source: Census 2011

### 4.2.1 Estimation of Housing Shortage

Acute housing shortage in country specially in urban centres has become a burning problem of the day since house construction activities do not keep pace with the growth of population of urban centres. The number of houses has, therefore, been successively falling short of actual requirement of the urban population. Based on the Ministry of Housing and Urban Affairs, National housing shortage, the final estimation of housing shortage is calculated based on the corresponding factors such as homeless population, non-durability factor, Congestion factor, Obsolescence. It has been calculated based on the census 2011. For this exercise, the following assumptions were adopted with the reference to the Assam state, District and JMB Housing Profile based on Census 2011 housing data:

Table 4.12 Estimation of Housing Shortage for the base year 2011

Sl no.	Particular	No. of Shortage Household
1.	Shortage due to Houseless Population	4013
2.	Shortage due to Vacant Houses	849
3.	Shortage due to Dilapidated Houses	850
4.	Shortage due to Slum Population	2389
5.	Shortage due to Congestion 2011	160
6.	Shortage due to Obsolescence 2011	8511
Total Shortage for the year 2011		16772

Source: Compilation, T&CP, Jorhat

### 4.2.2 Housing Provisions

The housing provision is met by accommodating in the proposed Residential, Composite Use and Conservation zones. It is proposed to facilitate the provision of a fully serviced dwelling unit for each family and reduce the gap between housing shortage and supply through suitable measures. The planned catering for the additional housing is as mentioned in Table 4.13.

Table 4.13 Housing requirements for the year 2021, 2031, and 2041

Year	Additional Population	Household Size	Additional Household	Catering for the shortage	Total Housing Need (decade wise)
2021 (Short Term)	269572	4.2	7439	6709 (40%)	14148
2031 (Medium Term)	298814	4	17958	5032 (30%)	22990
2041 (Long Term)	333055	4	26519	5032 (30%)	31551
<b>Total</b>			<b>51916</b>	<b>16772</b>	<b>68689</b>

Source: Compilation, T&CP, Jorhat

#### 4.2.2.1 Housing Provision by Income Group

As per the Ministry of Housing and Urban Affairs, the population is categorized based on the income level such as Economically Weaker Section (EWS), Low Income Group (LIG), Medium Income Group (MIG) and High-Income Group (HIG).

The Table 4.14 indicates that the housing shortage for 2041 is calculated for each classification based on income level. This table helps to earmark the affordable housing in the Jorhat Master Plan Area and would also help to formulate the housing policy.

Table 4.14 Housing requirement by different Income group

Year	Total Housing Need (decade wise)	EWS (20%)	LIG (30%)	MIG (40%)	HIG (10%)
2021 (Short Term)	14148	2830	4244	5659	1415
2031 (Medium Term)	22990	4598	6897	9196	2299
2041 (Long Term)	31551	6310	9465	12620	3156
<b>Total</b>	<b>68689</b>	<b>13738</b>	<b>20606</b>	<b>27475</b>	<b>6870</b>

Source: MoHUA/Compilation, T&CP, Jorhat

### 4.3 Future Housing Locations

In order to cater to the demand for housing, areas for residential use have been proposed as per the availability of developable land in planning area.

New residential development zones are identified and proposed in the north east region of the planning area in Gajrpuriya (Borigaon), Chengeli Gaon, Gohain Tekela Gaon, Aliamukhia Gaon, Naosolia Gaon, and No. 1 Bamun Gaon, and in the southern region Baghmariya is identified for residential development. Most of residential development zones are in the north east region of the planning area and Town Planning Schemes are proposed in the same to boost up the growth of the area, which was lacking behind as compared to the western part of the city, that is growing rapidly.

The central Jorhat has become over crowded. Population density in few wards of Jorhat is above 300 persons per hectare. For balanced development, new activity centers are proposed in the periphery like the future administrative complex, industrial zones, new sub-CBDs.

### 4.4 Land Management Techniques

Since land has been the most important resource for housing since decades, land acquisition models have been developed so as to acquire land for public purposes, growth of future townships, industries and so on. Some of the oft repeated urban development models like gentrification and urban renewal lead to land speculation and ousting of low-income people. There has also been an increasing concern towards developing a proper Resettlement and Rehabilitation package. Under the present situation of land market where much land is in private hands, government intervention can be through mechanisms listed below.

#### 4.4.1 Land Acquisition and Banking

Land banking involves advance acquisition of land for government use, or large-scale public ownership of undeveloped land for further use. A revolving fund can be developed by acquiring fringe areas at low prices, developing it, and disposing it off at a higher price. With the surplus money thus generated, further parcels of land can be acquired.

#### 4.4.2 Land Pooling

This is another form of land acquisition. Private land is acquired by public authority with multiple plots and owners. The public authority then consolidates the area, organizes the plots, develops the area with provision of services. Finally, plots are given back to the original owners in proportion to their original plot size. The reduced area is compensated by the increase in the land value due to development. This was tried in Australia as early as 1928. A participatory process was adopted, where public authority prepared draft layouts with redistribution arrangements in consultation with the land owners. When a planned layout is prepared with

services and new plot subdivisions, extra plots are made available that are sold at market prices to offset the cost of development.

#### **4.4.3 Land Readjustment**

This concept has been successfully tried in Korea, Japan, and Taiwan. The process may start with either the government or the people (at least 80% of land owners) petitioning for readjustment of fringe land from rural to urban category. A site plan is prepared, infrastructure and services are provided and the enhanced market value of new sites is estimated. Government retains just enough plots to repay costs of infrastructure and services. Original owners get back remaining sites in proportion to initial contribution.

#### **4.4.4 Land Sharing**

It has often been found that the security of tenure is the single most important factor for poor people to improve their own living conditions. Action taken by the government for any site development increases its market value especially in the area of slum and squatter settlement. In an attempt to establish the land rights in slums and squatter areas, government is often caught as an arbiter between the slum dwellers on one hand and the land lord on the other. The option available in that case is a spectrum of five options as follows: (Angel, 1985).

1. Resist eviction and occupy the entire land.
2. Negotiate on a land sharing agreement and resettle on a part of the land making the rest of the land available for development.
3. Agree to resettle on alternative site.
4. Agree to a compensation for land clearing.
5. Leave the site without any compensation.

In this case the landlord would desire the options available at the bottom of the spectrum while the slum dwellers would like the options at the top. This results in a stale-mate situation. The land sharing example has been particularly successful in Bangkok in such situation. It is acceptable to both parties since slums are not wholly uprooted and they get resettled in the same location thus keeping their work to home equation more or less the same. The landlord finds it acceptable since he can immediately put the land to development instead of a long and uncertain period of litigation.

### **4.5 Housing Policies in India**

#### **4.5.1 Pradhan Mantri Awas Yojana - Urban**

Pradhan Mantri Awas Yojana – Urban (PMAY-U), a flagship Mission of Government of India being implemented by Ministry of Housing and Urban Affairs (MoHUA), was launched on 25th June 2015. The Mission addresses urban housing shortage among the EWS/LIG and MIG categories including the slum dwellers by ensuring a pucca house to all eligible urban households by the year 2022, when Nation completes 75 years of its Independence.

The HFA policy envisages providing, according to the President's Speech, "every family with a pucca house with water connection, toilet facilities, 24x7 electricity supply and access".

1. *Affordable Housing-in-Partnership (AHP)*: Private developers receive a subsidy of INR 150,000 for constructing units meant for low-income households within their housing projects. AHP follows the 'resettlement' model, which involves relocation of beneficiaries, away from their original settlements.



2. *In-situ Slum Redevelopment (ISSR)*: Private developers demolish existing slums, and replace them with apartment buildings, also on slum land. In exchange, they receive a subsidy of INR 100,000 and a portion of the slum land to undertake commercial developments. ISSR follows the 'redevelopment' model, which involves demolishing slums and constructing new housing in its place, but here private developers are incentivised to pay for the redevelopment.
3. *Beneficiary-Led Construction (BLC)*: Low-income households receive a subsidy of INR 150,000 to build or improve housing themselves, contingent on land ownership. BLC partially follows the 'upgrading' model as it supports self-construction. Upgrading also includes ensuring security of tenure and protection from eviction, and most importantly, improvement in basic services such as water, sanitation, roads, and street lighting. Such a comprehensive upgrading approach is not part of BLC, as it only includes support for self-construction.
4. *Credit-Linked Subsidy Scheme (CLSS)*: Households receive a subsidy on the interest on housing loans, upto INR 235,000 to 267,000, which can be used to purchase new houses, or improve existing ones. CLSS follows either the 'resettlement' or 'upgrading' model, depending on the manner in which the housing loan is used. Loans used to purchase apartments will involve 'resettlement' while those for housing construction or improvement partially follow the 'upgrading' model, like BLC.

#### **4.5.1.1 Affordable Rental House Complex**

Ministry of Housing & Urban Affairs has initiated Affordable Rental Housing Complexes (ARHCs), a sub-scheme under Pradhan Mantri Awas Yojana - Urban (PMAY-U). This will provide ease of living to urban migrants/ poor in Industrial Sector as well as in non-formal urban economy to get access to dignified affordable rental housing close to their workplace.

#### **4.5.2 Pradhan Mantri Awas Yojana – Rural**

PMAY-G aims at providing a pucca house, with basic amenities, to all houseless householder and those households living in kutcha and dilapidated house, by 2022. The immediate objective is to cover one crore household living in kutcha house/dilapidated house in three years from 2016-17 to 2018-19. The minimum size of the house has been increased to 25 sq.m (from 20sq.m) with a hygienic cooking space. The unit assistance has been increased from ₹ 70,000 to ₹ 1.20 lakh in plain and from Rs 75,000 to Rs 1.30 lakh in hilly states, difficult areas and IAP district. The beneficiary is entitled to 90 to 95 person day of unskilled labour from MGNREGS. The assistance for construction of toilet shall be leveraged through convergence with SBM-G, MGNREGS or any other dedicated the source of funding. Convergence for piped drinking water, electricity connection, LPG gas connection etc. different Government programmers are also to be attempted.

#### **4.5.3 Assam Urban Affordable Housing Policy**

The Government of Assam desires to realize the dream of being an affirmative partner State to the GoI for building a sustainable and transformative nation by providing every citizen a decent affordable shelter, by formulating "Assam Urban Affordable Housing & Habitat Policy". This can be realized by operational strategies that can provide affordable housing reflecting an individual's/ family's socio-cultural, economic, spatial, basic services and other intangible needs, and imparting a dignified & satisfactory independent as well as community life.

The aim of this policy is to create an enabling environment for providing "affordable housing for all" with special emphasis on EWS and LIG and other vulnerable sections of society such

as Scheduled castes/Scheduled Tribes, Backward Classes, Minorities and senior citizens, physically challenged persons in the State and to ensure that no individual is left shelter less. The Policy further aims to promote Public Private People Participation (PPPP) for addressing the shortage of adequate and affordable housing.

#### **4.5.4 Apun Ghar Scheme**

Apun Ghar is a new home loan scheme for Assam Government employees under which home loans will be provided to the state govt. employees at subsidized interest rates. The Government of Assam has signed an MoU with the State Bank of India to provide home loans at subsidized interest rates to its employees.

Under the Apun Ghar scheme, the state government would provide housing loans at a subsidized rate of 5% for its women employees and 5.5% for men employees. The loan would be provided without collateral security and processing fee. The main objective of Apun Ghar housing loan scheme is to provide housing to all state residents.



## Chapter 5: Transportation

This section of the report deals with Traffic & Transportation system for the Greater Jorhat Revised Master Plan Area. The planning area is well connected by roads, railways, air and water transport. The transport infrastructure for Jorhat mainly developed in the British period and was later upgraded and expanded. The town has access to practically all forms of transportation – Roads, Railways and Air. Also, Jorhat is connected with the National Waterway – 2, through Nimatighat.

### 5.1 Regional Transportation

Table 5.1 Important cities and their distance from Jorhat

Sl no.	Places connecting Jorhat	Distance in km		Duration		
		Road	Rail	Road	Rail	Air
1.	Guwahati	303	375	6 hours	8 hours	30 mins
2.	Kolkata	1270	1344	30 hours	36 hours	1.5 hours
3.	Delhi	2209	2234	42 hours	34 hours	3.5 hours
4.	Dibrugarh	137.5	165	3 hours	4 hours	-
5.	Silchar	412	376	10 hours	9 hours	-
6.	Nagaon	180	297	3 hours	6 hours	-
7.	Kohima	200	-	5 hours	-	-
8.	Imphal	333	-	9 hours	-	-
9.	Shillong	365	-	7.5 hours	-	-
10.	Itanagar	137	-	5 hours	-	-
11.	Siliguri	715	766	16 hours	14 hours	-

Source: Compilation, T&CP, Jorhat

#### 5.1.1 Road Network

The NH 715, historically known as Assam Trunk Road passes through the planning area and links Jorhat with upper Assam up to Arunachal Pradesh in the east, and the rest of Assam in west. Because it is situated on Assam Trunk Road, the city of Jorhat has excellent access to the rest of the state. Roads play an important role in Jorhat Town and the planning area. The Primary network of road-rail-navigation in/near Jorhat Town was developed during the British period, mainly to carry forest and agricultural products and tea. As the Jorhat town is like gateway to upper Assam, it serves as major transport node.

#### 5.1.2 Rail Transport

A branch railway line connects Jorhat with the main line in Mariani and Furkating via Golaghat from which it has connection, to other part of the state/ country. There is total three stations in the Jorhat Master Plan Area:

1. *Jorhat Town Railway Station (JTTN) (Category: NSG-5)* – In the loop line connecting Mariani to Furkating. It is a Non-Sub Urban Grade 5 categorised station by the Indian Railways, with an annual projected passenger flow from 1 million to 2 million.
2. *Cinnamara Railway Station (CMA) (Category: NSG-6)* - In the loop line connecting Mariani to Furkating. It is a Non-Sub Urban Grade 6 categorised station by the Indian Railways, with an annual projected passenger flow from 0.5 million to 1 million.

- Table 5.2 Statistics of Jorhat Town Railway Station*

Sl. No.	Description	Nos. / Amount
1.	Daily / Monthly Passenger train	5 nos.
	Goods train –weekly -monthly	4 nos. 17 nos.
2.	Yearly Average Passenger	3.64 Lakhs.
	Goods train	9004 wagons.
3.	Yearly Income from movement of goods	₹ 0.57 Crores.
	Yearly Income from movement of Passenger	₹ 10.52 Crores.

Although Jorhat has its own railway station, but the major railway station of the district is the Mariani Junction (*MXN*) (*Category: NSG – 4*), which has direct connectivity with the major railheads of the country.

Jorhat Town is connected by air too. An airport is situated at Rowriah (*IATA Code: JRH*), about 5 kms away from Jorhat Town, is inside the planning area. It is connected with direct flight to Guwahati, Kolkata and Delhi. Currently, only Indigo provides flight services to Jorhat. Average flight fares from Jorhat to Kolkata ranges from ₹4000 to ₹6000, and average flight fares from Jorhat to Delhi ranges from ₹10000 to ₹15000. The flight fares gradually increase as the travel date comes closer. During the financial year of 2022, the airport recorded a footfall of 1.5 lakh passengers, with a total of 1263 aircraft movements. The airport also recorded a cargo movement of 242 Tonne.

Regional Connectivity Scheme under UDAN Helicopter services, being operated under the scheme of the Ministry of Civil Aviation, aims to boost the air-connectivity within the state by offering direct helicopter services to Tezpur, Jorhat, and Dibrugarh from the state capital.

Jorhat is also connected by water transport through the Brahmaputra River mainly to the world's largest river island Majuli as well as to other parts of the state under State Inland Water Transport Dept. and Central Inland Water Transport.

The river Brahmaputra having a length of 891 Km between Bangladesh Border and Sadiya was declared as National Waterway no. 2 (NW-2) on 1st September, 1988. Inland Waterways Authority of India (IWAI) is carrying out various developmental works on the waterway for improving its navigability. IWAI is responsible to develop the waterway for navigation. IWAI is maintaining a navigable depth of 2.5m in Bangladesh Border- Nimati (629 Km), 2.0 m in Nimati – Dibrugarh (139 Km) and 1.5m in Dibrugarh – Sadiya (Orumghat) stretch. At present the waterway is being used by vessels of Govt. of Assam, Army Border Security Forces, Tourism organization and other private operators. Long cruise tourist vessels are making voyages between Pandu and Majuli island near Nimati regularly. From October to May, over dimensional cargo (ODC) is also transported through the waterway from time to time.

The recently launched cruise ship MV Ganga Vilas from Varanasi to Dibrugarh has a stop in Nimati, for the siteseeing of Majuli. Starting the voyage from Varanasi, the cruise will cover a total distance of 3,200 km to Dibrugarh in Assam via Bangladesh.

## **5.2 History**

### **5.2.1 Road**

There is no concrete evidence when the AT Road was established in Jorhat, but the history suggests that connectivity was established during the reign of Ahom era, especially when the capital was shifted from Sivsagar to Jorhat. During the British era, the roads were planned and upgraded. The grid-iron pattern roads of the CBD area were developed during the British era.

### **5.2.2 Railway**

A 7-mile narrow gauge line from Gohaingaon (a village closed to Kokilamikh Ghat) to Jorhat known as Kokilamukh Tramway was opened in September 9, 1883. Later on, the name of the “Kokilamukh Tramway” was changed to Kokilamukh state railway. In November 1884 the line was extended up to Dhali River near Titabar and the section was opened for goods traffic on 15th Dec, 1884. The line was further extended up to Titabar on 16th July, 1887. Again another 7-mile Long Branch line from Chenimora (Cinnamora) station to Mariani was completed by December, 1884 and was opened for goods traffic on January 7, 1885 and passenger traffic on February 26, 1888. In 1928, a meter gauge loop line connecting Jorhat with Furkating via Golghat was laid. The meter gauge line was converted into Broad Gauge (BG) line and opened for traffic on 15th August, 1998.

### **5.2.3 Airport**

The airport was established in early 1950s and commonly known as Rowriah Airport because it is located at Rowriah area of the city. Jorhat AFS is the Indian Air Force's first air base in the East. It is primarily a transport base for launching aircraft that carry out airdrops in the Naga Hills in Nagaland and Arunachal Pradesh. During early 1943, used by U.S. Army Air Force (USAAF), 10th Air Force (10th AF) fighters and later bombers and reconnaissance aircraft until early 1944.

## **5.3 Road Network**

Total road length within the Municipal limit is 94.3 km out of which 45.2 km is Municipal Road and the rest is PWD Road. Out of the 45.2 km, 2.3 km is Black Topped, 760 m is CC road, 2.6 km road is earthen, and majorly the rest is Paver Block Road with a length of 39.2 km. Residential localities have their own-separate road pattern unrelated to each other. Road network inside the planning area needs be strengthened by constructing missing links and improvement of existing roads and junctions. In the CBD area of Jorhat Town, grid iron pattern of road network exists. In other parts of the planning area, there is complete lack of any pattern of existing road network.

### **5.3.1 Service Level of Roads**

Level of service (LOS) is a critical part of transport planning. The objective of LOS is to ensure that all travellers can reach their destinations on time, with the minimum level of discomfort and inconvenience. A level of service is a way to objectively measure the performance of transport systems. Performance or the level of services (LoS) in the case of roads is measured in terms of quality of roads, carriageway, and level of street furniture and accessories. The desired level of service (LOS) in the urban roads is given in the **Table 5.3** below:

Table 5.3 Level of Service Identification

Urban Road Category	Arterial	Sub-Arterial	Collector/ Distributor	Local Street
Free-Flow Speed	80 km/hr	60 km/hr	50 km/hr	30 km/hr
Level of Service (LOS)	Average Travel Speed (km/hr)			
A	>72	>55	>45	>27
B	>56-72	>46-55	>37-45	>22-27
C	>40-56	>33-46	>28-37	>18-22
D	>32-40	>26-33	>22-28	>15-18
E	>26-32	>21-26	>17-22	>10-15
F	≤26	≤21	≤17	≤10

Source: IRC:106-1990

The table given below are the roads classified as major roads as per URDPFI, the hierarchy of roads are (a) Arterial Roads, (b) Sub-Arterial Roads, (c) Collector or Distributor Roads, and (d) Local Roads. A Level of Service analysis of the roads was done, and the result of the same is given in the **Table 5.4**.

Table 5.4 LOS analysis of Major roads in GJRMF area

SL No.	Name of the Major Road	Length (in km)	Existing Carriage way (in m)	Travel Speed Analysis	LOS	Priority Level	Remarks
<b>Arterial Roads</b>							
1	National Highway 715	21.5	20 m main Carriageway (4 Lane) + 6m Service Lane on Both Side	>72	A	Low	Under Expansion and Upgradation
<b>Sub – Arterial Roads</b>							
2	A T Road	7.64	9	≤21	F	Very High	• No dedicated lane and width. • Street Parking
3	K B Road	6	5.5	≤21	F	-	Narrow Road
4	Jorhat Mariani Road	12	7	>33-46	C	High	High Traffic
5	Jorhat Titabar Goronga Road	10	7	>33-46	C	Medium	Not up to Standard Width
6	Cinamara Titabar Road	2	5.5	>46-55	B	Low	Not up to Standard Width
7	Nimati Road	7.1	5.5	>33-46	C	Medium	Narrow Road
8	Charigaon Road	6.06	5.5	>26-33	D	Medium	Narrow Road
9	Garali Road (Nirmal Chariali to KB Road)	0.78	10	>21-26	E	Very High	• High Traffic • Street Parking • CBD Area
10	Borpatra Ali	1.36	18	>46-55	B	Low	
<b>Collector/Distributor Road</b>							
11	Sonari Gaon	2.6	5.5	>17-22	E	Very High	Narrow Road
12	Borbheta Chariali to AAU	0.65	7	>28-37	C	Medium	High Traffic
13	Agricultural Farm Road	2.38	5.5	>28-37	C	Medium	High Traffic

14	TRP Road	1.6	12	>37-45	B	Low	
15	Garmur Tocklai (JEC) Road	4.8	7	>37-45	B	Low	
16	Bamun Gaon to JEC Road	2.56	5.5	>22-28	D	High	<ul style="list-style-type: none"> <li>• Narrow Road</li> <li>• High Traffic</li> </ul>
17	J B Road	3	9	>22-28	D	High	<ul style="list-style-type: none"> <li>• Narrow Road</li> <li>• High Traffic</li> </ul>
18	Mallow Ali	3	7	>28-37	C	Medium	High Traffic
19	K K Handique Road	1.14	14	>28-37	C	Low	<ul style="list-style-type: none"> <li>• High Traffic</li> <li>• Illegal Parking</li> </ul>
20	Na Ali to JMM Road	1.09	5.5	>22-28	D	High	<ul style="list-style-type: none"> <li>• Narrow Road</li> <li>• High Traffic</li> </ul>
21	Club Road	2.05	5.5	>22-28	D	High	Narrow Road
22	KKB Road	0.78	7	>28-37	C	Medium	
23	Darangi Chuk Road	0.65	7	>28-37	C	Low	
24	Cinamora Bazar Road	2.7	5.5	>22-28	D	Medium	Narrow Road
25	Raja Maidam Road	0.95	5.5	≤17	F	Very High	<ul style="list-style-type: none"> <li>• High Traffic</li> <li>• Encroachment</li> </ul>
26	Tokolai Road (Tokolai Rajabari village to Mission compound Tiniali)	1.1	5.5	>28-37	C	Medium	Narrow Road
27	Sankarpur Road	1	4.5	>28-37	C	Medium	Narrow Road

Source: Field Survey and Analysis, T&CP, Jorhat

### 5.3.2 Road Intersection

Transit Nodes serves as an important point where trip is generated as well as attracted. They are formed by integrated cluster of different modes of transport. When it comes to transportation, a junction is a location where vehicles can change lanes, directions, or sometimes even forms of transportation. The efficiency of traffic intersections and bottlenecks has a significant impact on how well the road network functions. More congestion is seen at intersections when traffic volume exceeds the design capacity. There will also be additional issues including traffic congestion, delays, and irregular flow.

Table 5.5 List of Major intersections in GJRMP area

Sl no.	Area	Location	Description
1.	Main Entrance to Jorhat Town	Bohotia Gaon Bypass Point	Entry to the town and to link administrative HQ.
		Kenduguri Bypass Point	Entry to the town and to link administrative HQ.
2.	Town Area	Baruah Chariali Point	Intersection of AT Road, and Tuls Narayan Sharma Path
		Na-Ali Point	Connecting Doss & Co. Chariali, Licubari MES and Titabor Subdivision
		Dhalaxatra Press Point	Intersection of KC Road, and KB Road
		Gitarthi Point	Connecting Borpatra Ali with KB Road



		Garali Point (Nirmal Chariali Point)	Connecting Lahoti point, Cinamora and Titabor Subdivision
		Old Cicuit House Road Point	Intersection at Rajmao Pukhuri Road, Old Circuit House Road, and AT Road
		Lahoti Point	Connecting JEC and Town
		Doss & Co. Chariali	Intersection at KB Road, Jorhat Na Ali Road
		Bisturam Baruah Hall	Intersection at JB Road and At Road
		PWD Point	Connecting KB Road with Jorhat Mariani Road
3.	Cinamara	Cinamara Point	Entry to Mariani and Titabor
		Sadar Tiniali	Connecting Club Road and Na ali to Mariani Road
4.	Lichubari	Lichubari Chariali	Entry to AAU, Baghchung area, and Majgaon Road
5.	Sarbaibondha	By Pass Junction	Entry to Kokilamukh
6.	Sonari Gaon	Sonari Gaon Junction	Connecting Borbheta Chariali, Gayan Gaon, and AT Road.
6.	1 No. Bamun Gaon (Kenduguri)	1 No. Bamungaon Point	Entry to By Pass and Nimatighat.

Source: Field Survey, T&CP, Jorhat

### 5.3.2.1 Congestion Points

Some of the intersections are extremely busy with very high traffic interchange, these intersections are termed as choke points and they need immediate intervention. Given below are the details of the choke points.

Table 5.6 Choke points in the intersections

Sl no.	Name of the Intersection (Coordinates)	Connecting Roads	Remarks
1.	Sonari Gaon Junction (26°45'13.0"N 94°11'24.7"E)	AT Road, Gayan Gaon, and Sonari Gaon	<ul style="list-style-type: none"> <li>• High Traffic</li> <li>• Congestion</li> <li>• Narrow Approach</li> </ul>
2.	Lichubari Chariali (26°43'33.3"N 94°12'46.8"E)	Jorhat Na Ali Road, Majgaon Road and AAU Road	<ul style="list-style-type: none"> <li>• High Traffic</li> <li>• Congestion</li> <li>• Narrow Approach</li> <li>• On-Street Parking</li> </ul>
3.	Sadar Tiniali (26°43'37.4"N 94°13'39.1"E)	Na Ali, Club Road, and Mariani Road	<ul style="list-style-type: none"> <li>• High Traffic</li> <li>• Rail Crossing</li> <li>• Narrow Approach</li> </ul>
4.	Approach to Railway Station (26°45'06.5"N 94°13'13.2"E)	Connecting Jorhat Town Railway Station	<ul style="list-style-type: none"> <li>• Extremely High Traffic During Train Arrival</li> </ul>

Source: Field Survey and Compilation by T&CP, Jorhat



### 5.3.3 Road Safety

Most of the accidents recorded take place along the highways and regional linkages. Basic reasons are difficult road alignment, poor road geometry, bad road surface conditions, and unstable road pavements.

List of identified accident black spots in the Jorhat Masterplan Area by the field survey of Town and Country Planning, Jorhat and Public Works Department (Road), and the recommendations to make them safe is given in **Table 5.7** below.

*Table 5.7 Identified Black Spots in the planning area*

Name of Road	Sl No.	Location	Observations	Suggestions
Jorhat Mariani Road	1	Near DTO Office	1. Excessive Parking on both side of the roads. 2. Fading of painting of speed bump 3. Inavailability of required road signages.	1. Restrictions of Parking to only one side. 2. Necessary Road markings and cautionary signages.
	2	Near Carmel School	1. Traffic Congestion during school hour period. 2. Inavailability of required road signages.	1. Traffic Regulation support for school vehicles. 2. Necessary Road markings and cautionary signages.
	3	Industrial Areas in Cinnamara	1. Parking of Heavy Vehicles by the side of road due to Presence of Industrial Area	1. Both side of the roads to kept parking free of heavy vehicles.
	4	Railway Crossings in the Entire Stretch	1. Inadequate space alongside the road for vehicles during rail crossing. 2. Invisibility Factor 3. High slope in Ramp for the crossing	1. Necessary Road markings and cautionary signages. 2. Speed restrictions in these road junctions. 3. Extra Lane for waiting cars
NH 715	5	Entry/Exit to service Lanes in the entire stretch	1. Over speeding of Vehicles in Highway. 2. Movement in Wrong side of the Road 3. Cattles lying in Road 4. Lack of Pedestrian Road crossing facilities	1. Necessary Road markings and cautionary signages. 2. Construction of Pedestrian crossings at required locations 3. Measures should be taken to keep cattles of the road.
	6	Junctions in Malow Ali, JB Road and Charigaon Road	1. Absence of a traffic direction separator 2. Absence of an Electronic Signal	1. Necessary Road markings and cautionary signages. 2. Construction of a Grade Separator (Flyover)
Jail Road	7	Between Borbhetta Chariali and Borbhetta Puja Mandir	1. Improper Road Geometry and Undulation. 2. Narrow Stretch 3. Presence of deep shallow road beside the road.	1. Necessary Road markings and cautionary signages. 2. Barrier protection in the shallow side.
	8		1. Traffic Congestion during school hour period.	1. Traffic Regulation support for school vehicles.

Sonari Gaon Road	9	Near KV Air Force School	2. Inavailability of required road signages.	2. Necessary Road markings and cautionary signages.
		Turning near Bamun Gaon Road and Rail Crossing	1. Invisibility in Turning 2. Frequent formation of potholes due to poor draining	1. Necessary Road markings and cautionary signages. 2. Concave Mirror at Turning Point for visibility of traffic from other side.
TRP Road	10	Junctions in TRP Road and Tulsi Narayan Path, Cholahdara Road, and Old Circuit House Road.	1. Absence of a traffic direction separator 2. Absence of an Electronic Signal	1. Construction of traffic separator (Traffic Island) 2. Necessary Road markings and cautionary signages. 3. Installation of Traffic Signal
JB Road	11	Junction near Macharhat Naamghar	1. Invisibility of Darangi Chuk Road 2. Narrow Entry to Darangi Chuk Road	1. Necessary Road markings and cautionary signages. 2. Installation of Traffic Signal
	12	Turning near Pasupati Phukan Road and Saibaibonda Puja Mandir	1. Invisibility Factor 2. Over speeding of Vehicles 3. Overtaking of Vehicles in Turning Point	1. Necessary Road markings and cautionary signages. 2. Concave Mirror at Turning Point for visibility of traffic from other side.
DCB Road	13	Junctions in KKB Road, and KC Road	1. Invisibility of Roads due to build up. 2. Narrow approach	2. Necessary Road markings and cautionary signages. 2. Concave Mirror at Turning Point for visibility of traffic from other side.

Source: Field Survey and Compilation, T&CP, Jorhat

### 5.3.3.1 Road Signages and Markings

Indian roads have one of the highest numbers of accidents in the world. The knowledge of traffic signs ensures safe driving. This understanding of the road signs also cuts down on road accidents considerably.

Traffic signs give an indication about road conditions and acts as guide for drivers to follow at major intersections, roundabouts or junctions, to make sure that road traffic functions properly. Traffic signs can also be interpreted as road safety signs, which are an integral part while driving on Indian roads.

#### **Mandatory Traffic Signs**

There are various types of signs indicating various circumstances on the roads. The mandatory traffic signs try to ensure smooth traffic flow on the roads, the most common being the traffic light signal. The traffic light signal regulates the traffic movement on the roads so that, the vehicles can carry out a smooth and safe drive.

The traffic regulatory authorities design the vehicle movement on the roads of the cities. This design is often carried out by traffic signs such as "STOP", "NO ENTRY", "ONE WAY", "RIGHT TURN PROHIBITED", "SPEED LIMIT", "NO OVERTAKING", etc. These signs are to regulate traffic, reduce traffic jams and ensure seamless flow of vehicles in the cities.

### ***Cautionary Traffic Signs***

These are cautionary traffic signs cautioning the driver of a probable danger ahead. These traffic signs warn the driver to be more careful on the road ahead. For example, "PEDESTRIAN CROSSING", "NARROW ROAD AHEAD", "HAIR PIN BEND", "ROUND ABOUT", "CROSSING AHEAD" etc. These are road safety signs to help prevent road accidents which may result in injury or death.

### ***Recommendations***

The traffic signs in roads shall be strictly in according to the Indian Road Congress Code of Practice for Road Signs **IRC:067**.

#### **5.3.4 Hierarchy of Roads**

The roads in the planning area are classified as per Indian Road Congress Manual on Space Standard for Urban Roads **IRC:69**

**Arterial Roads:** This system of streets, along with expressways where they exist, serves as the principal network for through traffic flows. Significant intra-urban travel such as between central business district and outlying residential areas or between major suburban centre takes place on this system. Continuity is essential for arterial streets to ensure efficient movement of through traffic.

**Sub-Arterial Road:** These are functionally similar to above category, but with somewhat lower level of travel mobility. Their spacing may vary from about 0.5 km in the central business district to 3 to 5km in the suburban fringes.

**Collector/Distributor Streets:** The function of these streets is to collect traffic from local streets and feed them it to the arterial and sub-arterial streets or vice versa. They may be located in business areas, industrial areas, or residential areas.

**Local Streets:** These are intended primarily to provide access to abutting property and normally do not carry large volumes of traffic. Majority of trips in urban areas either originate or terminate on these streets.

Table 5.8 Classification of Urban Roads

Sl no.	Road Types	Design Speed (kmph)	Space Standards (m)
1.	Urban Expressway	80	50-60
2.	Arterial Road	50	50-60
3.	Sub-Arterial Road	50	30-50
4.	Collector Distributor Road	30	12-30
5.	Local Street	10-20	12-20
6.	Access Streets	15	6-15

Source: Urban Road Code of Practice, MoHUA

### **5.4 Traffic Characteristics in Jorhat**

Almost all the roads in Jorhat are now becoming very congested for increase of the motor vehicles of all type of vehicles in last few years. The major traffic congestion points are AT road, Gar Ali Road, Old Public Bus stand, Na Ali and Baruah Chariali. Tremendous increase of motor vehicles, narrow and unmaintained roads lack of parking facilities tendency to traffic rushes. The problem arises in mostly during peak hours. Normally, this happens twice a day-

once in the morning and another in the evening, the time when most people commute. (Borgohain, J., 2020)

#### 5.4.1 Vehicle Registration

The number of registered vehicles till date given in the **Table 5.9** below pertain to the whole jurisdiction of D.T.O., Jorhat.

*Table 5.9 Vehicles registered in Jorhat DTO till date*

Sl no.	Vehicle Category	On Road Vehicles	Sl no.	Vehicle Category	On Road Vehicles
1	Earth Moving Vehicle	1	20	Moped	149
2	Cash Van	3	21	Agriculture Tractor	8
3	Mobile Clinic	1	22	Excavator (Commercial)	75
4	Excavator (NT)	19	23	Trailer (Agricultural)	199
5	Motor Car	54089	24	Camper Van/Trailer	0
6	M-Cycle/Scooter	191904	25	Three-Wheeler (Personal)	0
7	Construction Equipment Vehicle	0	26	Fire Tender	3
8	Mobile Canteen	1	27	Good Carriers	6143
9	Ambulance	45	28	Vehicle fitted with Compressor	0
10	Bus	245	29	Three-Wheeler (Passenger)	1139
11	Vehicle fitted with Rig	1	30	Maxi Cab	281
12	Trailer (Commercial)	96	31	Fork Lift	1
13	M-Cycle/Scooter with Side Car	23	32	Omni Bus	0
14	Private Service Vehicle	0	33	Tractor (Commercial)	427
15	Articulated Vehicle	14	34	Trailer for Personal Use	0
16	Fire Fighting Vehicle	0	35	Three-Wheeler (Goods)	104
17	Motor Cab	634	36	Crane Mounted Vehicle	13
18	e-Rickshaw	0	37	Construction Equipment Vehicle	46
19	Dumper	813	38	Vehicle Fitted with Generator	5
<b>Total</b>					<b>256482</b>

Source: District Transport Office, Jorhat

##### 5.4.1.1 Growth of Vehicles in Jorhat

The annual growth of vehicles within the jurisdiction of D.T.O. Jorhat is given below. In just eight years the growth rate of vehicles has nearly doubled in Jorhat.

*Table 5.10 Annual growth of vehicles in Jorhat DTO*

Type	Category	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Transport Vehicles	Trucks	101	109	135	156	137	112	108
	LCV Goods	644	1042	954	1037	691	881	1239
	Bus	6	18	25	43	5	7	35
	Three-Wheeler A/R	149	50	45	54	11	45	224
	Motor Cab	95	90	121	101	208	36	124

Non-Transport Vehicles	Motorcycle/ Scooter	7915	9994	12851	15708	3964	10545	14561
	Car	2808	3480	3877	4274	2404	3712	5287
	Trailer/Tractor	183	194	235	283	212	176	204
	Govt. Vehicle/Others	42	68	43	22	2	21	147
<b>Total</b>		<b>11943</b>	<b>15045</b>	<b>18286</b>	<b>21678</b>	<b>7634</b>	<b>15535</b>	<b>21929</b>

Source: District Transport Office, Jorhat

It is expected that around 3,25,000 more vehicles may be registered under the Jorhat DTO by the year 2041, which will exert a very high pressure in the present road scenario. The present road network needs to be upgraded immediately to fulfill the needs by 2041.

Passenger Car Unit (PCU) is a relative weightage factor given to the traffic volume of individual vehicle category to deal with the heterogeneity in a mixed traffic situation.

Table 5.11 PCU factors for different type of vehicles

Vehicle Type	Equivalent PCU factor percentage composition of vehicle type in traffic stream	
	5%	10% and above
<b>Fast Vehicles</b>		
Two Wheelers	0.5	0.75
Passenger Cars, Pickup Van	1	1
Auto Ricksaw	1.2	2
Light Commercial Vehicle	1.4	2
Truck/Bus	2.2	3.7
Agricultural Tractor/Trailer	4	5
<b>Slow Vehicles</b>		
Cycles	0.4	0.5
Cycle Ricksaw	1.5	2
Tonga (Horse Drawn Vehicle)	1.5	2
Hand Cart	2	3

Source: Central Road Research Institute

#### 5.4.2 Parking

High ownership pattern and excessive reliance on private mode of movement, i.e., two-wheelers and cars exert huge parking demand. As most of the parking demand is met by on-street facilities due to negligible stock of off-street facilities, this is perhaps the biggest contributor to traffic congestion in the core area.

The prevailing parking facilities in Jorhat are not adequate. There are no off-street parking facilities on most of roads of Jorhat, few govt and private institutions have their own parking facilities in their premises, but only for their own premises. Commercial buildings in Jorhat have parking provisions in many, but due to inappropriate engineering and low maintenance, people choose to park on the road itself creating traffic hazards. On street parking should be regulated in the central business area in A.T. Road and Gar Ali. Sufficient off-street parking space at various places particularly near or within the area of concentrated activities is very essential so as to avoid the use of city roads for parking vehicles, which adds to traffic congestion.

The multi-storied car parking in the place of old public bus stand shall be renovated and three new locations for multi-storied car parking facility shall be identified for the city.



Fig. 5.1 On-street parking in Garali (left); Jorhat Mariani Road (right) (Source: T&CP)

The recommended equivalent car space (ECS) for different types of vehicles as per the URDPFI guidelines are given in the **Table 5.12** below.

Table 5.12 ECS factors for different type of vehicles

Sl no.	Vehicle Type	ECS
1.	Car/Taxi	1.00
2.	Two-Wheeler	0.25
3.	Auto Rickshaw	0.8
4.	Bicycle	0.1
5.	Trucks/Buses	2.5
6.	Emergency Vehicles	2.5
7.	Rickshaw	0.5

\*Note – One ECS is equivalent to 12.5 sq.m (5m x 2.5m)

Source: URDPFI

#### 5.4.2.1 Management of Parking Supply and Demand

There is a need to restrict (completely or partially) on-street parking activity on congested links to increase the capacity of the roads and improve traffic flow along them. On the other hand, off-street parking facilities have to be provided at strategic locations to meet the parking demand. A Parking Management Plan shall be incorporated following the aspects below:

1. Parking demand on various locations and sensitivity of the demand to parking fee.
2. Temporal variation in demand.
3. Availability of vacant spaces near concentrated parking generation zones where suitable off- street facilities can be located.
4. Existing availability of off-street parking facilities in public/private premises.
5. Parking space information system to reduce searching time.
6. Parking space provision in building bye laws and examining its adequacy in the context of growing vehicle ownership.



## 5.5 Public Transport in Jorhat

### 5.5.1 Inter City Movement

The major medium of intercity and interstate movement is through rail and road, with number of buses and trains connecting major cities in Assam and other states. The following **Table 5.13** and **Table 5.14** shows the no. of Passenger buses getting in and going out from different Bus Terminals of Greater Jorhat Revised Master Plan Area. The **Table 5.15** below shows the trains operating from Jorhat Town station.

Table 5.13 Nos. Of Buses Plying from Public Bus Stand under JDA

Sl. No.	Name of Vehicles	Destination	Nos.
1.	Traveller	Nagaon-Jorhat	31
2.	Traveller	Bokakhat-Jorhat	7
3.	Traveller	Sibsagar-Jorhat	6
4.	Traveller	Dibrugarh-Jorhat	21
5.	Traveller	Golaghat-Jorhat	4
6.	Traveller	Guwahati-Jorhat	4
7.	Day Super	Guwahati-Jorhat	3
8.	Night Super	Lakhimpur-Jorhat	1
9.	Night Super	Jorhat-Dhubri	2

Source: Filed Survey by the T&CP, Jorhat

Table 5.14 Nos. Of Buses Plying from Inter State Bus Terminus

Sl. No.	Name of Vehicles	Destination	Nos.
1.	Bus (Ultra)	Dibrugarh-Jorhat	24
2.	Bus (Ultra)	Sivsagar-Jorhat	3
3.	Bus (Ultra)	Lakhimpur-Jorhat	5
4.	Bus (Ultra)	Dimapur-Jorhat	2
5.	Omni Bus (ASTC)	Guwahati-Jorhat	10
6.	Omni Bus (ASTC)	Koch Bihar-Jorhat	4
7.	Traveller	Golaghat-Jorhat	9
8.	Star Bus	Sivasagar-Jorhat	17
9.	Star Bus	Nagaon-Jorhat	4

\* Some other buses from Titabor, Sibsagar and Dibrugarh also operates via Jorhat to Guwahati

Source: Filed Survey by the T&CP, Jorhat

Table 5.15 List of trains plying from Jorhat Town Railway Station

Sl no.	Train	Origin & Destination	Frequency
1.	BG Express (15665/15666)	Mariani to Guwahati via Jorhat	Daily
2.	Nagaland Express (15669/15670)	Jorhat Town to Guwahati	Daily
3.	Jorhat Town Guwahati Jan Shatabdi Express (12607/12608)	Jorhat Town to Guwahati	Six Days
4.	Tinsuka Jorhat Town Passenger	Jorhat Town to Tinsukia	Six Days

Source: Indian Railways

Apart from the trains running through the Mariani – Jorhat – Golaghat branch line, there are several interstate trains including the Rajdhani and Shatabdi Express that runs through Mariani Junction to several other parts of India. A large portion of the passenger footfall in Mariani Junction is originated or destined from/to Jorhat. The junction shall be considered a crucial transportation terminal for the planning area, and emphasis shall be given for the connectivity of the city to the junction.

### 5.5.2 Intra City and Regional Movement

Small capacity maxi-cabs and auto rickshaws are the only public transit facility available for intra-urban movement and they are primarily available along few links of the road network. Only about 1/5th of work trips and educational trips are made by public transit facilities. Access to public transit facilities is mostly by walking. Passenger loading/unloading from these vehicles as well as parking takes place within the carriageway – obstructing the vehicular traffic in most cases.

Table 5.16 List of IPT routes for Regional connectivity in Jorhat

Sl no.	Route	Operator	Frequency	Vehicle Type (Capacity)
1.	Jorhat - Jhanji	Under ASTC	15 mins	Maxi Cab (10)
2.	Jorhat - Dergaon	Under ASTC	15 mins	Maxi Cab (10)
3.	Jorhat - Mariani	Under ASTC	15 mins	Maxi Cab (10)
4.	Jorhat - Titabor	Under ASTC	15 mins	Maxi Cab (10)
5.	Jorhat - Nimati	Under ASTC	30 mins	Maxi Cab (10)
6.	Jorhat – Mohbondha	Under ASTC	30 mins	Maxi Cab (10)
7.	Jorhat - Pulibor		3 mins	Auto Rickshaw (4)
8.	Jorhat - Kenduguri		3 mins	Auto Rickshaw (4)
9.	Jorhat - Rowriah		10 mins	Auto Rickshaw (4)
10.	Jorhat - Kokilamukh		10 mins	Auto Rickshaw (4)
11.	Jorhat - Alengmora		10 mins	Auto Rickshaw (4)
12.	Jorhat – Garmur (JEC)		5 mins	Auto Rickshaw (4)

Source: Filed Survey by the T&CP, Jorhat

Though there are several IPT routes in the planning area, there is still a gap and the public transportation access index is very low when it comes to last mile connectivity. Last Mile connectivity (LMC) is a globally acclaimed sustainable measure in urban transportation. It discourses the issues commonly faced in recent times concerning environmental, economic, and social aspects of transit systems.

### 5.5.3 Public Transport Terminals

#### 5.5.3.1 Interstate and Intercity Transport Terminal

For interstate and intercity transports, there are dedicated terminals in the planning area, but the issue is with the private operators, who don't use the facility to the fullest, and many even don't use the terminals and operate from the roads directly.

#### 5.5.3.2 Intracity and Regional Transport Terminal

There is a total of 1139 registered three-wheeler auto-rickshaws, and 635 no. of registered motor cab. These auto-rickshaws and motor cabs ply in the planning area as Intermediate Public Transport (IPTs). Jorhat Municipal Board has not allowed the movement of E-Rickshaws considering the congestion factor, but controlled allowance to run the e-rickshaws shall achieve the last mile connectivity. The slow-moving cycle rickshaws are still a part of transportation in

the planning area. The major problem arising with the IPTs is they don't have a dedicated terminal, some terminals temporarily exist in unused lands, and some exist beside the road, which is a major concern for road congestion and safety.

Table 5.17 Analysis of the Public Transport Terminals in Jorhat

Terminal Center	Location	Observation
<b>Inter State and Intercity Bus Station</b>		
ISBT	Kotoki Pukhuri	<ul style="list-style-type: none"> <li>Located at Western Corner of Jorhat Municipality</li> <li>Well planned but not maintained</li> <li>Waiting Room/ Shed / Toilet for Gents &amp; Ladies are Available</li> </ul>
ASTC Bus Terminus	Baruah Chariali	<ul style="list-style-type: none"> <li>Located in Baruah Chariali</li> <li>Presently serving as a regional transport stand</li> <li>Waiting Room/ Shed / Toilet for Gents &amp; Ladies are to be renovated</li> </ul>
JDA Bus-Stand	Kotoki Pukhuri	<ul style="list-style-type: none"> <li>Bitumen/ pavers block surfacing immediately required.</li> <li>Not managed properly from the traffic circulation point of view.</li> <li>Toilets to be renovated</li> </ul>
Nimati & Teok Mini Bus Stand	No dedicated site	<ul style="list-style-type: none"> <li>Unplanned without any waiting shed/ toilet</li> <li>Facilities in front of ASTC Bus Terminus</li> </ul>
Delux Omni Bus	No dedicated site	<ul style="list-style-type: none"> <li>No dedicated Site</li> <li>Road side parking</li> </ul>
Old Public Bus stand- Near HPO, Jorhat	No dedicated site	<ul style="list-style-type: none"> <li>Unplanned way side near old public bus stand over where Multi Level Car Parking is being constructed</li> </ul>
<b>Railway Station</b>		
Jorhat Town Rly Station		<ul style="list-style-type: none"> <li>Building to be expanded to provide more passengers creating more space for ticket seekers</li> </ul>
Rowriah Rly Station		<ul style="list-style-type: none"> <li>Building is to be rennovated</li> </ul>
Cinnamara Rly Station		<ul style="list-style-type: none"> <li>Building is to be rennovated</li> </ul>
<b>Intra city and Regional Connectivity</b>		
Pulibor Auto Stand	Baruah Chariali	<ul style="list-style-type: none"> <li>No dedicated Site</li> <li>Road side parking</li> </ul>
Rowriah Auto Stand	Baruah Chariali	<ul style="list-style-type: none"> <li>No dedicated Site</li> <li>Road side parking</li> </ul>
Chowk Bazar Auto Stand	Chowk Bazar	<ul style="list-style-type: none"> <li>No dedicated Site</li> <li>Road side parking</li> </ul>
Motor Cab Stand	ASTC	<ul style="list-style-type: none"> <li>Detoriated Condition</li> <li>No public facilities</li> </ul>
Motor Cab Stand	BB Hall	<ul style="list-style-type: none"> <li>No dedicated Site</li> <li>Road side parking</li> </ul>

Source: Field Survey, T&CP, Jorhat

### **5.5.3.3 National Urban Transport Policy**

The objective of this policy is to ensure safe, affordable, quick, comfortable, reliable and sustainable access for the growing number of city residents to jobs, education, recreation and such other needs within our cities. This is sought to be achieved by:

1. Incorporating urban transportation as an important parameter at the urban planning stage rather than being a consequential requirement
2. Encouraging integrated land use and transport planning in all cities so that travel distances are minimized and access to livelihoods, education, and other social needs, especially for the marginal segments of the urban population is improved
3. Improving access of business to markets and the various factors of production
4. Bringing about a more equitable allocation of road space with people, rather than vehicles, as its main focus.
5. Encourage greater use of public transport and non-motorized modes by offering Central financial assistance for this purpose.
6. Enabling the establishment of quality focused multi-modal public transport systems that are well integrated, providing seamless travel across modes.
7. Establishing effective regulatory and enforcement mechanisms that allow a level playing field for all operators of transport services and enhanced safety for the transport system users.
8. Establishing institutional mechanisms for enhanced coordination in the planning and management of transport systems.
9. Introducing Intelligent Transport Systems for traffic management
10. Addressing concerns of road safety and trauma response
11. Reducing pollution levels through changes in traveling practices, better enforcement, stricter norms, technological improvements, etc.
12. Building capacity (institutional and manpower) to plan for sustainable urban transport and establishing knowledge management system that would service the needs of all urban transport professionals, such as planners, researchers, teachers, students, etc.
13. Promoting the use of cleaner technologies
14. Raising finances, through innovative mechanisms that tap land as a resource, for investments in urban transport infrastructure.
15. Associating the private sector in activities where their strengths can be beneficially tapped.
16. Taking up pilot projects that demonstrate the potential of possible best practices in sustainable urban transport.

## **5.6 Goods Transportation and Freight Movement**

The freight movement is not allowed in the town area during daytime, however freights travelling further to Mariani and Titabar are allowed to travel through Sonari Gaon road on the west and Bamun Gaon – JEC road in the east because of the absence of an alternate route, this creates a heavy congestion on these particular roads, and the junctions in the AT Road.

Table 5.18 Analysis of Goods Terminal in Jorhat

SL no.	Terminal	Observations
1.	Truck Stand	<ul style="list-style-type: none"> <li>No Organised stand</li> <li>Roadside truck parking on AT Road</li> </ul>
2.	Jorhat Rly Station	<ul style="list-style-type: none"> <li>Loading/Unloading yards create serious traffic congestion in the town</li> </ul>
3.	FCI Godown	<ul style="list-style-type: none"> <li>Newly Constructed dedicated facility for FCI</li> </ul>

Source: Field Survey, T&CP, Jorhat

There is a dedicated truck terminus of JDA in the Aliamukhia Gaon for loading and unloading of the goods, but it is rarely used by the operators, because of the costing point of view. The traffic congestion of the town will be reduced after functioning of the Truck Terminus which is constructed by JDA at Aliamukhia Gaon under the NLCPR fund of Govt of India. The parking problems of the CBD will be also reduced to a great extent after completion of the multistoried car parking, which is constructed by JMB under the NLCPR fund of Govt of India.



Fig. 5.2 Goods yard in Old Jorhat Railway Station (Source: T&CP)

A multimodal facility comprising for both of Roads and Rail freight is required for the city, the connection of Jorhat Railway Station Goods yard and the JDA Truck Terminus is a missing factor in this case.

## 5.7 Gender Sensitive Approach in Transport Planning

For a long time, gender perspectives were absent in the design of public transportation, pathways, and transit facilities. In India, transport systems are less convenient for women because of the predominant participation of men in planning. Transport systems were traditionally designed to facilitate work-oriented trips, targeting regular commuters and focusing on the economy and efficiency of operation, paying very less attention to non-work trips. Traveling through a public transportation system by both males and females caters to multiple meanings and dimensions respectively.

Women share different characteristics while using public transport as compared to men. The trips made by women can be for work, education, household chores, fulfilling the requirements of children, or can be for health issues. Women also tend to accompany dependent children or senior citizens while traveling, which increases their sense of responsabilization. Though this



does not argue that men do not travel other than to work or take no responsibility for the household, this travel pattern of multi-chaining activities is more familiar to women. There are different roles for women and men in society.

The working schedule of a woman demands her to be flexible, dropping the kids to school, coming back for household activities, and again going out for work. Generally, women prefer to work in areas that are near the house because of this flexible time schedule resulting in the majority of the trips made by women being shorter in length and increasing their dependency on public transport and non-motorized transport. In the case of men, mostly they have to go out for work once and come back late, which also makes them able to work far away from home. The majority of users of public transport are women. The factors that will be sensitive to gender are: Public Transport, Road Safety, Uninterrupted and well-maintained pedestrian network, proper street lighting, and reducing the dark spots.

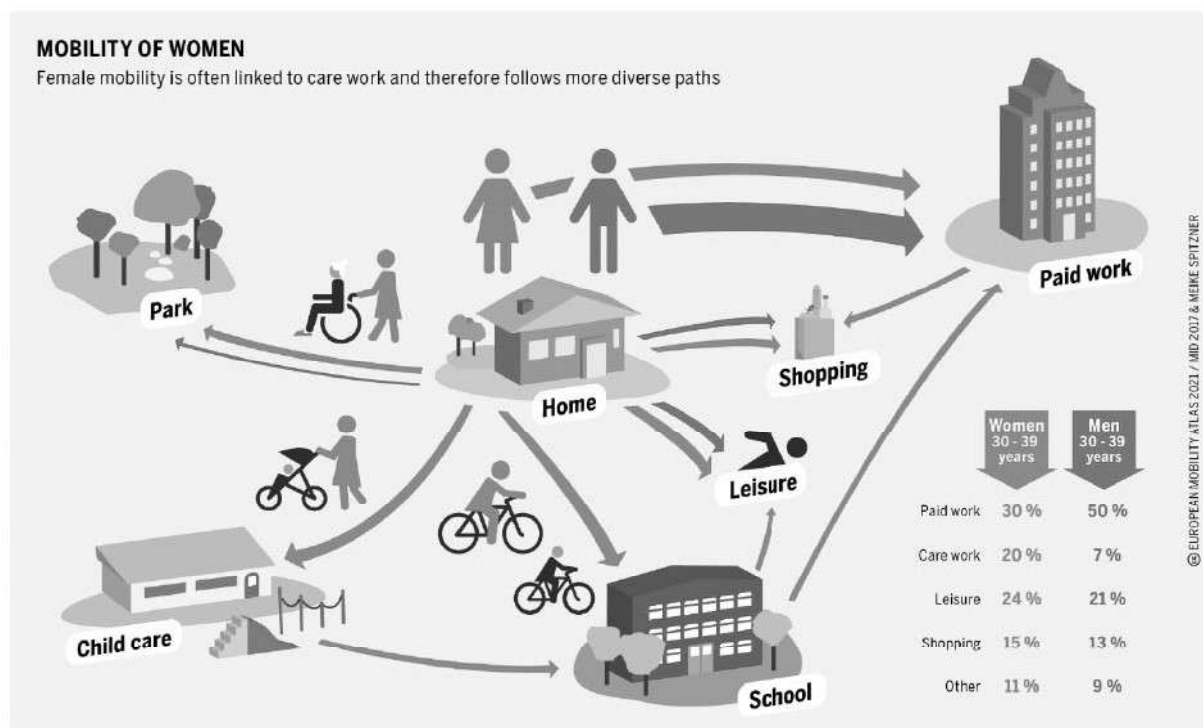


Fig. 5.3 Illustrations depicting Gender Sensitive Mobility (Source: European Mobility Atlas)

## 5.8 Street Design

Walking is one of the dominant modes of transport, particularly for work and school trips. However, the existing facilities severely lack the basic necessities for safe and secure pedestrian movement. Huge pedestrian volume is observed along one of the most congested routes resulting in serious level of pedestrian-vehicular conflict. This conflict not only makes pedestrian movement unsafe but adversely affects the vehicular traffic flow.



Fig. 5.4 Illegal Street parking and encroachment in a footpath in Jorhat (Source: T&CP)



Pedestrian mobility should be considered as a priority. Inadequate street facilities, discontinuation of foot pathway, lack of zebra crossing hampers walkability and becomes a concern of safety. Poor walkways and people crossing roads are to blame for the majority of traffic accidents. Also amateurly engineered construction, leaving unlevelled surfaces and an absence of ramp or slope is a factor affecting pedestrian mobility specially for person with disabilities, pregnant women, senior citizens because they are ones who are mostly ignored while designing of the streets.

The facilities are not adequate to cater the pedestrian mobility. Footpath are not properly built; some stretches of the road don't even have a footpath. Though the ROW is wide enough in few roads, majority of roads are narrow to house the facility. Another major problem is the encroachment in the footpaths, by vendors, illegal parkings.

### ***Recommendations***

1. Guidelines for proper street design shall be prepared in context of the planning area. The street planning guidelines of IRC should be strictly followed. It will also help to reduce road accidents.
2. Adequate walkways commensurate to the pedestrian traffic volume on both sides of the carriageway to segregate pedestrian traffic from vehicular carriageway. Some of the links have intermittent footpaths which should be converted to continuous stretches as far as possible.
3. Appropriate at-grade or grade separated pedestrian crossing facilities at intersections.
4. Complete restriction of on-street parking on pedestrian pathways – even if they are lying empty.
5. Installation of CCTVs and proper illumination of dark areas shall be done. Installation of a safe booth or kiosk with helpline numbers, panic button, and emergency call facilities in case of emergency.
6. Improvement of surface condition for steps with due attention to riser/tread width as well as installation of railings and intermediate landing facilities to facilitate pedestrian movement.
7. Intersections should have proper signages, zebra crossings, traffic lights, surveillance systems. Apart from footpath and cycle path, there shall be also provision for multipurpose zones to house public toilets, bus stands, seating areas, informal activities, small street shops, landscape in curb, etc. as per provision. These street amenities and facilities shall not hamper the footpaths and cycle tracks.

## **5.9 Need for a Comprehensive Mobility Plan**

A comprehensive mobility plan is needed for the city, where a detail transportation survey shall be carried out, including the travel demand forecasting in the planning area. The plan shall also include detail analysis of parking supply and demand, public transportation, road safety.

## **Chapter 6: Infrastructure, Public Utilities & Services**

### **6.1 Physical Infrastructure**

#### **6.1.1 Water Supply**

The objective of a public protected water supply is to supply safe and clean water in adequate quantity, conveniently and as economically as possible. Rising demand of water due to rapid urbanization is putting enormous stress while planning the water supply system for an area; it is evident to consider water conservation aspects, which may not be possible through optimal use of available water resources, prevention and control of water and effective demand management.

Urban water supply infrastructure is designed with a focus on treatment and distribution and with only minimal consideration of source water characteristics. Sustainable urban water supply systems must link more closely with the natural water systems in which they are located. Water is an essential resource for the development of a region and it shall meet the domestic, industrial and irrigation requirements within the planning area. Presently, the planning area is influential on both part of ground and surface water sources to address the water requirements of the area. Due to non-contiguous geomorphic nature of the planning area and for better management water supply within the planning area is divided into two, urban area and rural area.

The main sources of water in Jorhat Master Plan Area are the surface water from Bhogdoi River, and underground sources. Recently, a water supply project was started under Jal Jeevan Mission to supply water to rural areas in Jorhat District with total supply to 33 Gaon Panchayats, the water will be sourced from Brahmaputra River.

Components of a public water supply system:

1. **Protected Water Supply-** Source and capacity of Storage system: There are various sources of water supply and its storage system in the town.
2. **Service Reservoir:** A service reservoir is a water storage container that holds clean water after it has been treated in a water plant, and before it is piped to the end users. These containers are covered, and are designed to keep the water safe from contamination. Their main purpose is to provide a buffer within the water supply system so that water supplies can be maintained across periods of varying demand.
3. **River Infiltration Gallery:** Infiltration Galleries are capable of supplying large quantities of water, and are used where wells are unable to supply water needs, i.e., where an impermeable rock barrier affects well efficiency, or where surface water sources are too shallow for intake screens. Infiltration galleries are one or more horizontal screens placed adjacent to (on-shore), or directly underneath (bed-mounted), a surface water source.
4. **Bore Well Pumping System:** A bore well is a well of 6" to 12" in diameter drilled into the earth for retrieving water. The depth of a bore well can vary from 50 feet to 3000 feet. Water is pumped out to surface through electricity/generator.
5. **Pressure Tank:** Tank that is used to ensure consistent water pressure and for storage of water. Usually located in basement of house but sometimes (in older settings) located in well pit.

**6.1.1.1 Water Supply Scenario in Urban Areas**

In Jorhat Town, the water supply is mainly provided by Public Health Engineering Deptt, Urban Water Supply & Jorhat Municipal Board. These schemes were constructed and maintained by the respective authorities.

*Table 6.1 Water Supply Schemes in Jorhat Municipal Board*

Sl. No.	Name of Scheme (Source)	Capacity	Nos of home connections	No of stand pipe	Area covered	Ward Nos of Jorhat Town & Name of villages covered by the scheme
1	Bhogdoi Water Supply (Surface Source – Bhogdoi River)	0.72 MLD	1323 Nos	26 Nos	Fancy Ali, Bhogdoi Embankment, Formud Ali Path, RB Lane, Rajamaidam Road, AT Road, NewVille Road, Balibat, Gar Ali, Dewal Road, Rupohi Ali, JPR, PWD Pvt Road, Bez Gohain Ali, Chaliha Lane Road etc.	Ward No- 2,3,4 part of 5,6,7,8,9 &10
2	Nehru Park Water Supply (Underground)	0.18 MLD	560 nos	14 Nos	TNS Road, OCH Road, TRP Road, Cholahdora Road, Malow Ali, AT Road, DCB Road, KB Road & Phukan Ali	Ward No 12,13 & Part of 10
3	Sonari Gaon Water Supply (Underground)	0.18 MLD	515 Nos	10 Nos	Sonari Gaon 1 & 2 No Path, Seuni Gaon Road, Jail Road, Uday Nagar, Ambikagiri Nagar, Nandapur, Sankardev Path, Bordoloi Nagar, Atilagaon Road etc.	Ward No-15, 16 and 11
4	Macharhat Water Supply (Underground)	0.13 MLD	502 Nos	21 Nos	Milan Nagar Raod, Gajpuria road, JB Road, Darangichuk Road, Pachani Bora chuk Road, DakhinSarbaibondh a Road, Ventilation Road, Boroda Phukan Road etc.	Ward No 1,14 and part of 5
<b>Total</b>		<b>1.21 MLD</b>	2900 Nos	71 Nos		

Source: Jorhat Municipal Board.

Table 6.2 Water Supply Schemes under Assam Urban Water Supply

Sl. No	Name of Scheme	Source of Water	Capacity	Nos of home connections	Length of Pipe	Area covered	Ward Nos. of Jorhat Town & Name of villages covered by the scheme
Jorhat Town Water Supply Scheme Phase-I							
1	Nehru Park WSS Zone-I (Underground)		4.080 MLD	3159	32.60 KM	Jail Road, Solicitor Road, Porsh Baruah Road, DCB Road, DCB Hostel Road, Atila Gaon, OCH Road, KKB Road, Cholahdora, RB Road, Sastrapith Road, Suagpur, Nehrupark, Smashan Road, Gayan Gaon, Darrangi Chuk, Malow Ali, TRP Road, AT Road, Tarajan etc.	10,12,13 (part) & 15 (part)
2	Na-Ali WSS, Zone-III (Surface Source - Bhogdoi River)		5.867 MLD	1426	17.70 KM	Atilagaon, Na-Ali, Bongalpukhuri, Bansbari(Part), Pub-Bongalpukhuri	8,9 & 17
3	Bhogdoi WSS, Zone-IV (Surface Source - Bhogdoi River)		1.946 MLD	3125	25.40 KM	Dohaborachuk, Bongalpukhuri, Chandan Nagar, Club Road, JEC Road, Rajahari, Banshari, Fancy Ali, JPR Road, Old& New Balibat, Thana Road, Mitha Pukhuri, Chamber Road, AT Road, maruwari Patty, Gar Ali, Dewal Road, Itakhuli, Garmur etc.	3,7,8 & 18
4	Old Civil Hospital WSS, Zone-VI (Underground)		3.427 MLD	1885	13.68 KM	AT Road Bazar Side, JB Road, OCH Road LH Side, Macharhat, Darrangichuk, Boroda Phukan Road, Sarbaibondha, Rajamaidam Road, New colony, Gajpuria, New Vill Road, Nazironibari, Kabarsthan, RB Lane, Horizon Colony, Royal Road, Formud Ali Path, Subhash colony, Netaji Colony, Naziranibari, Digambarchuk,	1,2,4,5,13(Part) & 14 (Part)

					Kalisthan, kachariporia etc.	
5	Dhenuchusa WSS, Zone -VII (Underground)	1.502 MLD	1392	13.07 KM	Dhenususa Gaon, AT Road, Borigaon, Gohaintekela, Kenduguri, Charigaon (Part), Borbora Tekela, Chandoritekela, Suwanigaon, Seumi Ali, Chengeligaon, Nimati Road, Ananda Nagar, Kenduguri etc.	19
<b>Jorhat town Water Supply Scheme Phase-II</b>						
1	Sonari Gaon WSS, Zone- II (Underground)	3.378 MLD	818	18.00 KM	Sonarigaon NO-1 & 2, Kakotigaon, Bamungaon, Gayangaon, DCB College Road, Jail Road etc.	5 & 16
2	Macharhat WSS, Zone-V (Underground)	2.50 MLD	128	18.29 Km	JB Road, Macharhat, Darrangichuk, Baroda Phukan Road, Sarbaibondha, Krishna nagar, Gojpuria Road, Milan Nagar etc	1, 12(part), 13(Part), 14 (part)
<b>Total</b>		<b>22.7 MLD</b>	<b>11933 nos</b>			

Source: AUWS & SB, Jorhat.

Though Jorhat Urban Agglomeration is well served by pipe water connection, and there is no gap that can be found in the present water demand, but the quality of supplied water is not up to the mark. In some cases, presence of Arsenic in the supplied water has been reported now and then.

#### 6.1.1.2 Water Supply Scenario in Rural Areas

Table 6.3 Water Supply Schemes under Public Health Engineering Department

Village Code (Census 2011)	Name of Town/ Villages as in Census 2011	Name of WSS	Source of Water	Capacity	No. of House Connections
<b>Jorhat East Circle, Jorhat Town 1,2,3 no. Mouza</b>					
801595	Jorhat (MB)	Nir Nirmal Pariyojana	River Source	3,70,000	996
293753	Chekonidhara (CT)	Nir Nirmal Pariyojana	River Source		320

293754	Kamalabaria N.C. (CT)	Kamalabaria Gaon	Deep Tube Well	80,000	120
801595	Kamalabaria Gaon (OG) Ward No. 029				
Jorhat East Circle, Charigaon Mouza					
293737	Hukimara Gaon ( <i>Only Part</i> )	Charigaon Zone PWSS	River Source	3,50,000	118
293738	Mout Gaon	Fokola Pathar Zone PWSS	River Source	70,000	761
293739	Dahikhor Gaon	Rangdoi Zone PWSS	River Source	80,000	448
293740	Baghmuria Gaon	Charighoria Baghmura PWSS	Groundwater	50,000	232
293741	Chari Gaon	Charigaon Zone PWSS	River Source	3,50,000	84
293742	Sonari Gaon	Charigaon Zone PWSS	River Source	3,50,000	141
293743	Gajpuriya Gaon	Gajpuria PWSS	Groundwater	80,000	293
293744	Kalakhwa Gaon	Charigaon Bharali Chuk Part II PWSS	Groundwater	1,50,000	298
293745	No.1 Bamun Gaon	1 No Bamun Gaon	Groundwater	1,00,000	175
293746	Kotoha Boria Gaon	Kathonikuri Na-Bora	Groundwater	80,000	200
293747	Aliamukhia Gaon	Hatigarh Padumoni	Groundwater	80,000	117
293748	No.2 Bamun Gaon	2 No Bamun Gaon	Groundwater	1,00,000	165
293749	Naosolia Gaon (Nau Salia Gaon)	Naosolia	Groundwater	60,000	70
801595	Chengeli Gaon (OG) Ward No. 020	Chengeli Gaon	Groundwater	80,000	180
801595	Gohain Tekela Gaon (OG) Ward No. 021	Gohain Tekela Gaon	Groundwater	1,00,000	135
Jorhat East Circle, Goromur Mouza					
293750	Duliapam Gaon	Dulia Gaon, Duliapam	Groundwater	80,000	
293752	Kumar Kaibarta Gaon (CT)	Kumar Koibarta	Groundwater	80,000	
801595	Duliagaon (OG) Ward No. 022	Dulia Gaon	Groundwater	80,000	135
801595	Cinnamara Grant (OG) ( <i>Only part</i> ) Ward no. 23	Nir Nirmal Pariyojana	River Source	2,20,000	167
801595	Toklai Cha Bagicha (OG) Ward No. 024	Toklai Chah Bagicha	Groundwater	1,60,000	
Jorhat East Circle, Hatigorh Mouza					
293730	No.2 Ghar Pholia Gaon	Gharpholia	Groundwater	50,000	50
293731	No.1 Gharpholia Gaon	Gharpholia	Groundwater	50,000	50
Jorhat East Circle, Charaibahi Mouza					
801595	Chowdang No.1 (OG) Ward No. 026	Chowdang Gaon 1 No.	Groundwater	80,000	
801595	BarbhetaChapari (OG) Ward No. 031	Nir Nirmal Pariyojana	River Source	5,50,000	37
Jorhat West Circle, Charaibahi Mouza					
293633	Hazari Gaon	Hazari Gaon	Groundwater	60,000	60
293634	Pakimuri Habi Gaon	Pokimarihabi Gaon	Groundwater	40,000	65
293635	Bam Chuck	Chirotia Bam Chuk	Groundwater	80,000	
293661	Rongai Habi	Nir Nirmal Pariyojana	River Source	5,50,000	121
293662	Senchoa Gaon	Sensuwa	Groundwater	80,000	350
293663	Choudang Gaon No.2	Na-Ali Chowdang Gaon	Groundwater	80,000	50
293664	Baghmoria	Baghmoria	Groundwater	80,000	150
293665	Chutiakari	Chutiakari	Groundwater	80,000	230



293675	Bhakat Cheumi	Bhakat Cheumi	Groundwater	80,000	
293679	Nowsolia Gaon (CT)	Naosolia	Groundwater	1,00,000	105
801595	Sonari Gaon (OG) Ward No. 028	Kharagerua	Groundwater	1,60,000	
Jorhat West Circle, Hazari Mouza					
293601	Dulia Gaon	Kamar Gaon	Groundwater	80,000	110
293602	Rajatia Gaon	Rajotia	Groundwater	80,000	
801595	Nakari Bamun Gaon (OG) Ward No. 030	Nakari	Groundwater	80,000	
Jorhat West Circle, Khongia Mouza					
293672	Charingia	Nir Nirmal Pariyojana	River Source	2,60,000	120
293638	Goriahabi Grant	Chilakora Basti	Groundwater	60,000	70
293640	Ajan Bamun Gaon	Ajan Bamun Gaon	Groundwater	80,000	
293660	Chaliha Gaon	Nir Nirmal Pariyojana	River Source	2,20,000	301
293659	Kuhia Boria (Kuhia Boria Gaon)				
293639	Dhekelia Borsaikia Gaon	Nir Nirmal Pariyojana	River Source	2,60,000	200
Jorhat West Circle, Sorucharai Mouza					
293630	Porbotia Gaon	Pulibor Bamun Gaon	Groundwater	80,000	
293631	Bhatemora Gaon	Bhatemora Porbotia	Groundwater	80,000	
801595	Bohotia Gaon (OG) Ward No. 027	Nir Nirmal Pariyojana	River Source	3,30,000	308
801595	Sarbaibandha (OG) Ward No. 025	Sarbaibondha	Groundwater	1,60,000	
293677	Dhekorgorha (CT) ( <i>Only part</i> )	Nir Nirmal Pariyojana	River Source	1,60,000	631
Jorhat West Circle, Porbotia Mouza					
293678	Charingia Gaon (CT)	Nir Nirmal Pariyojana	River Source		48
Teok Circle, Holongapar Mouza					
293875	Meteli Gaon	Nir Nirmal Pariyojana	River Source		129
293876	Ghorpholia Gaon	Gharpholia	Groundwater	50,000	
Mariani Circle, Katani Mouza					
294125	Kumar Hazarika Gaon	Nir Nirmal Pariyojana	River Source	1,60,000	217
294126	Katani Gaon	Nir Nirmal Pariyojana	River Source	1,60,000	200
294127	Na-Pamua (Na Pam Chowdang Gaon)	Napamuwa	Groundwater	80,000	
294128	Kathkatia Gaon	Kathkotia	Groundwater	80,000	
<b>Total</b>		<b>77,30,000 Lts. (7.73 MLD)</b>			

Source: PHED, Jorhat.

Though most of the villages within GJRMP area are well served by pipe water connection, but the quality of supplied water is not upto the mark. In some cases, presence of Arsenic in the supplied water has been reported now and then.

At present only 14833 numbers of households have their home connection in Jorhat town. More than 90% per cent of total households of Jorhat Municipal area have water supply connection. Some of the Govt. Offices/Institutions have water supply connection in Jorhat Municipal area and some connections are found outside municipal area of urban water supply projects; only 71 number of street taps are available for community service in Jorhat Municipal Board, in the

planning area, 50 number of villages have water supply schemes installed by the PHED Govt. of Assam with only 3042 numbers of home connections and only 26 numbers of stand pipes.

### **6.1.1.3 Groundwater Scenario**

#### *Hydrogeology*

The area is underlain by unconsolidated alluvial sediments of the Quaternary age, which can be differentiated into i) Older and ii) Younger alluvium. The Older alluvium occupies the upland areas with sediments of oxidized and relatively compact nature, while the younger alluvium occurs along the low-lying tracts of the area along the river courses (Plate II). The southern part of the area, adjacent to the Naga hill range is covered by surficial 5 blanket of clay, belonging to younger alluvium and probably has been derived from the adjacent hills which are composed of the rocks of Tertiary age.

Ground water in Jorhat occurs under water table to semi-confined conditions in the near surface conditions and in the deeper horizon, under semi-confined to confined conditions. Depth to water level in the water table zone varies from 0.41 to 3.07 m bgl in the pre-monsoon period and 0.56 to 3.41 m bgl during post-monsoon period. The predominance of clay formation in the depth of 30 to 50 m poses problem in storage of ground water in the district, however, local variation in the existence of very limited thickness of sand beds mixed with clay performing as conduits of ground water is also observed.

#### *Groundwater Source*

The net ground water availability estimated in the year 2009 is 1273.71mcm. The existing gross ground water draft 171.09mcm and the stages of development are 13% only. Future provision for domestic and Industrial use is 34.65mcm and for Irrigation use is 1093.68mcm. Assessment unit can be categorized into 4 categories as SAFE, SEMI-CRITICAL, CRITICAL, and OVER-EXPLOITED. In Jorhat district stage of ground water development is 13%, which shows under the SAFE category. As long-term water level trend does not show any major change so the whole district may be considered as SAFE. (2013, Central Ground Water Board)

### **6.1.1.4 Future Demand Projection**

#### *Domestic Water Demand*

In order to calculate the demand for a projected year, it has to be calculated for certain stages as per CPHEEO Manual.

1. Intermediate Stage (20 years from the Base Year) – 2031
2. Ultimate Stage Demand (30 years from the Base Year) – 2041

Water supply demand shall include domestic demand, fire demand, and institutional demand, etc. as per CPHEEO guideline. In order to calculate the demand, it is essential to calculate the projected population for the defined stages. The domestic water supply demand is taken as 135 lpcd.

One-third of the total firefighting water shall be available with the firefighting unit, the other two-third shall remain in the site premises available at all time. Formula for calculating the one-third firefighting water demand required for the administration is considered to be as  $(100 * (\text{Population}/1000) ^{0.5}) / 1000 \text{ MLD}$ .

Table 6.4 Domestic Water Demand

Sl No.	Particular	Populati on	Amount of Water Supply	Total Demand (MLD)	Populati on	Amount of Water Supply	Total Demand (MLD)
Year		2011 (Base Year)			2021		
1	Demand for Existing Population	2,45,331	135	33.12	2,69,572	135	36.39
2	Fire Demand			1.57			1.64
3	Unaccounted Loss (15%)			4.97			5.46
	<b>Total</b>			<b>39.65</b>			<b>43.49</b>
Year		2031			2041		
	Demand for Existing Population	2,98,814	135	40.34	3,33,055	135	44.96
	Fire Demand			1.73			1.82
	Unaccounted Loss (15%)			6.05			6.74
	<b>Total</b>			<b>48.12</b>			<b>53.53</b>

Source: Compilation by T&amp;CP, Jorhat

*Institutional Water Demand*

The institutional water demand for the year 2041 in the GJRM area is calculated and given in the **Table 6.5** below:

Table 6.5 Institutional Water Demand

Sl no.	Type of Land Use	Area (in sq.km)	Amount of Water Supply	Total Demand (MLD)
1	Commercial Area	1.21	1.68 MLD/km <sup>2</sup>	2.03 MLD
2	Public and Semi-Public	8.84	1.68 MLD/km <sup>2</sup>	14.85 MLD
3	Industrial	0.78	2.25 MLD/km <sup>2</sup>	1.76 MLD
	<b>Total</b>			<b>18.64 MLD</b>

Source: Compilation by T&amp;CP, Jorhat

*Water Demand Summary*

Table 6.6 Summary of Water Demand

Sl No.	Particulars	Demand
1	Population Projected (2041)	3,33,055 Nos
2	Water Supply @135 lpcd	44.96 MLD
3	Fire Fighting Demand	1.82 MLD
4	Unaccounted Loss @15%	6.74 MLD
5	Institutional Water Demand	18.64 MLD
6	<b>Total Daily Demand (WTP Capacity)</b>	<b>72.17 MLD</b>
7	Storage - GLSR @ 67% of WTP	48.36 MLD
8	Storage - ESR @ 33% of WTP	23.82 MLD

Source: Compilation by T&amp;CP, Jorhat

The water demand of the master plan area is 72.17 MLD, including fire demand and institutional water demand, and 15% unaccounted loss of water. Water Treatment Plant and additional GLSR and ESR is required to cater future needs. Land requirement for 7 nos. of 10 MLD Water Treatment Plants is 1.33 Ha, with an additional 0.63 Ha for residential quarters (CPHEEO Manual).

### 6.1.1.5 Water Quality

Table 6.7 Water quality statistics and standards of surface water in various locations in Jorhat Town

Sl No.	Particular	Temp (°C)	Dissolved Oxygen (mg/L) (Required Level: > 5.0)	pH (Safe Level: 6.5-8.5)	Conductivity (µmhos/cm)	Biochemical Oxygen Demand (mg/L) (Safe Level: Less than 3.0)	Nitrate (mg/L)	Fecal Coliform (MPN/100 ML) (Safe Level Less than 2500 MPN/100 ML)	Total Coliform (MPN/100 ML)
1	Brahmaputra at Nimati Ghat	22	7.6	7.4	167	2.5	1.1	330	635
2	Bhogdoi River (NH, Jorhat)	25	7.25	6.9	193	2.3	0.8	515	1300
3	Bhogdoi River (Pujadubi)	25	7.3	6.8	194	2.1	0.8	330	605
4	Rajmao Pukhuri, Jorhat	27	6.7	7.3	91	2.35	0.9	330	605

Source: Central Pollution Control Board

As per the survey of Assam Pollution Control Board, Bhogdoi river has become polluted, with increase in BOD recorded during surveys, and at some point, reaching up to a level of 5.0 mg/L which is higher than the recommended average.

### Groundwater quality data in various locations of Jorhat

Table 6.8 Groundwater quality in Jorhat

	Temp (°C)	pH (Safe Level: 6.5-8.5)	Conductivity (µmhos/cm)	Biochemical Oxygen Demand (mg/L) (Safe Level: Less than 3.0)	Nitrate (mg/L)	Fecal Coliform (MPN/100 ML) (Safe Level Less than 2500 MPN/100 ML)	Total Coliform (MPN/100 ML)	Total Dissolved Solids (mg/L) (Max Level: 500 mg/L)	Fluoride (mg/L) (Recomm. Level: <1.5 mg/L)	Arsenic (mg/L) (Recomm. Level: <0.05 mg/L)
Jorhat Town	25	7.1	277	2.3	0.75	2	2	190	0.3	0.01
Garmur	26	6.8	235	2.2	0.75	2	2	135	0.3	0.01

Source: Central Pollution Control Board

As per Central Groundwater Board Survey, the arsenic and fluoride contain in groundwaters of Jorhat is under the safe level declared by WHO.

### 6.1.1.6 Action Plan for Sustainable Water Supply and Management

1. To reduce the dependency on ground water.
2. To reduce the gap of water supply, and to provide water supply to all the houses.
3. Expand the infrastructure periodically to meet the future demand.
4. The implementation of a 100 percent metering system.

5. Reduce the unaccounted loss in transmission and distribution to 15%.
6. Mandatory firefighting services in commercial, institutional, and industrial buildings with availability of 2/3rd of the individual firefighting demand immediately.
7. The remaining 1/3rd firefighting demand shall be available all time with the safety services. (Fire Services).

### 6.1.2 Drainage System

In Jorhat, some natural drainage of local origin is acting as the main drainage system. Six numbers of natural drainage system namely Rowriajan, Mohuajan, Tarajan, Tocklai, Anthubhangajan and Jawkhariajan are connected directly or indirectly to the river Bhogdoi and they are responsible for draining off majority of the city sewage. On the right bank of Bhogdoi river, a 10 kms Bejijan channel has been identified which drains substantial number of areas.

#### *Water Logging*

Water logging has become a serious problem in Greater Jorhat Town with the increase of the construction activities, which made the land congested and disrupted. The drainage system of Jorhat has been disrupting day by day due to unscientific land use system in the town and its surrounding villages. The amount of open surface mainly decreases in the core area of Jorhat town as construction activities with high-rise buildings have occupied the city in recent years. So, water logging is a very common phenomenon, even after small downpour, in this area. Not only core area of Jorhat town, water logging is a persistent problem in some other areas of Greater Jorhat Town. This water logging problem becomes pathetic in the town during rainy season.

It is observed that, almost all the wards, parts of Sarbaibondha, Chekonidhora villages have been experiencing high water logging problems where water remains more than 24 hours and the other wards, viz. 4, 5, 6, 8, 9, 10, 12, 13 & 15 and remaining villages have been experiencing less water logging problem where water remains not more than 24 hours. Water logging exist due to inadequate and unscientific provision of drain, improper management of existing drains, unauthorized settlement along the natural channels, de-siltation in the existing natural channels, unscientific road construction by raising the top crust of road almost after every two years and most importantly lack of co-ordination among the drain construction departments viz. Jorhat Municipality, Jorhat Development Authority, Public Works Department, Water Resource Department and last but not the least Rural Development in rural areas of Greater Jorhat.

Thus, water logging has become a major problem in Greater Jorhat by which population, more than 1 Lakh, are affected, badly every year. Growing urbanization and construction of high-rise buildings, non-biodegradable solid waste is responsible for this problem of water logging. A study is utmost importance to identify the waterlogged zones of Greater Jorhat, ward/ village wise waterlogged situation and its varying depth, waterlogged road and traffic congestion and the people who have been suffered from waterborne diseases (mainly in the slum and the squatter people) etc. Recommendations, such as, setting up new pumping station and maintaining the existing drainage system to its cent percent capacity etc. should be taken care of by the concerned authorities. But all these can be materialized properly with proper interest from every corner of concern.

#### *Drainage Engineering*

From field survey, data analysis and experiences, it is observed regarding the drainage characteristics in context to its width, depth, velocity and discharge that there is a slight



discrepancy in the results of pre- monsoon period data in maintaining hydraulic characteristics like the natural streams indicating restriction in the natural flow of the drain. But the same in the case of post monsoon period is nearly like the natural drainage, because in this season the contribution of runoff is obtained from rain as well as domestic use of water following the hydraulic geometry relationship like that of the natural system. Hence, the artificial drainage nearly follows the hydraulic geometry principle of the natural drainage system with adequate surface runoff. (Gogoi, P.; 2015)

#### *Bhogdoi River*

The river bed of Bhogdoi is very narrow and, as a result, the river reaches the danger point within 12 hours of precipitation during the flood season. The river has a strong propensity to alter its courses during heavy flood times owing to the shallowness of the river portion and low-lying adjoining regions. J Orhat and its suburbs were flooded in May 1977 owing to unprecedented and concentrated rainfall. Owing to poor drainage of the Tocklai and Tarajan drains, the problem was further exacerbated. It has created flood congestion due to the backwater movement of the river through the Tocklai canal, triggering floods and water logging in most areas of Jorhat, as the bed of the river Bhogdoi is higher than the level of the district. Thus, it has been shown that the intervention of man with natural drainage and its impact is maybe no more plainly evident than in the town of Jorhat. The embankment along the river Bhogodi has proven to be both a blessing and a curse for the region. They are helpful in the way that they shield the metropolitan environment from destructive flooding, but they are a curse since they do not enable water to be pumped out easily and therefore trigger water-logging in city areas. In comparison, the rise in the development of the city's badly drained low-lying zones, where no technological drainage scheme has been implemented, has rendered the problem worse. Following heavy rainfall, water-logging in the low-lying areas has become a frequent feature during the rainy seasons. (Kumari, C; Singh, C.;2018)

#### **6.1.2.1 Drainage Demand**

##### *Wastewater Flow*

Calculating wastewater flow we have to consider the peak flow rate. The Greater Jorhat Revised Master Plan area is 156.75 sq km, where there is no presence of a well-connected scientific drainage system.

*Table 6.9 Wasterwater flow in GJRMF area*

Sl No.	Particular	Demand	
1	Population Projected (2041)	3,33,055	Nos
2	Water Supply @135 lpcd	44.96	MLD
3	Wastewater (80% of Water Supply)	35.96	MLD
4	Wastewater Flow Rate	416.20	L/s
<b>5</b>	<b>Peak Flow Rate*</b>	<b>1664.8</b>	<b>L/s</b>

\*Peak flow rate (Q) – Peak flow factor\*\* x Average flow rate

\*\*Peak Flow Factor = 4 (For Sub Main)

*Source: Compilation by T&CP, Jorhat*

##### *Surface Run-Off*

Calculating the surface runoff

$$Q = c \times i \times A \text{ (Rational method)}$$

Where, Q = Peak flow rate

C = coefficient of runoff (depends on types of land use and ground slope)

i = intensity of rainfall (m/hr)



A=Area (in sq.m)

Table 6.10 Surface Run-off from the urban and rural areas of GJRMP area

Sl no.	Greater Jorhat Revised Master Plan Area	Area (in sq.km)	Dominant Land Use	c	ciAi
1	Jorhat Municipal Area (Existing)	9.73	High-Density Residential	0.65	6.33
2	12 Outgrowths (OG)	39.47	Medium-Density Residential	0.5	19.73
3	6 Census Towns (CT)	14.26	Medium-Density Residential	0.5	7.13
4	16 Villages in Jorhat East Circle	37.22	Low-Density Residential	0.4	14.89
5	19 Villages in Jorhat West Circle	44.34	Low-Density Residential	0.4	17.73
6	2 Villages in Teok Circle	4.31	Low-Density Residential	0.4	1.72
7	4 Villages in Mariani Circle	7.43	Low-Density Residential	0.4	2.97

Source: URDPFI/Compilation by T&CP, Jorhat

$$\text{Combined } c = 1/A \times (c_1A_1 + c_2A_2 + \dots + c_nA_n) = 70.5/156.74 = 0.44$$

Therefore,

$$Q = c \times I \times A = 0.44 \times 0.00000208 \times 156740000 = 143.448 \text{ m}^3/\text{s} = \mathbf{1,43,448.45 \text{ L/s}}$$

\*Note: Rainfall Intensity of Jorhat is considered as 7.5mm/hr

Total flow of water

$$\text{Total } Q = Q_{\text{wastewater}} + Q_{\text{rainwater}}$$

$$Q = 1664.8 \text{ L/s} + 143448.45 \text{ L/s} = 145113.25 \text{ L/s} = \mathbf{145.113 \text{ m}^3/\text{s}}$$

Therefore, a total of 145.1 m<sup>3</sup>/s water will be discharged from the planning area at peak hours, during an intense rainfall of 7.5 mm/hour.

#### 6.1.2.2 Strategies

1. Creation of surface impoundments in low lying areas and detention basin/tanks for control of flow and sedimentation and arresting of pollutants from entering water bodies.
2. Implementation of best management and innovative practices.
3. Holistic approach to planning including aspects of sustainability, consistency and community responsive values.
4. Preparation of action plan to restore the aquifers and large water bodies and integrate with small scale engineering and hydrologic functions to increase the capacity of natural sewerage and stormwater discharge.
5. To proposed in-situ recharge pits in relevant locations. (Ex: Along the important roads, public/open spaces, hard surface areas).
6. Mandatorily imposed rainwater harvesting practices in every plot and new constructions.
7. Use of semi-permeable surfaces/materials in public places, footpaths for improving in-situ rainwater discharge.

#### 6.1.2.3 Drainage Master Plan

Therefore, there is a requirement for a Scientific Drainage Master Plan for Greater Jorhat with the help of the following procedures-

1. **Delineation of Basin Boundary:** The catchment areas of the tributaries run through Greater Jorhat town have to be fixed with the help of contour survey. For Jorhat, Tocklai basin and Tarajan basins are more important as drainage problem is acute in these basins.
2. **Run off Design:** With the help of Rational Method after computing Run off coefficient, Intensity of Rainfall i.e., the average rate of rainfall per hour for the period of maximum rainfall of a given frequency of occurrence having a duration equal to the time of concentration and the tributary of a drain; the maximum rate surface run off from the catchment area of a drain can be calculated.
3. **Size of Drain:** From the maximum surface run off from the catchment area of a particular drain, its size can be calculated and to be designed with the help of Structural Engineering techniques.

Once the Master Plan on Drainage for Greater Jorhat is prepared, it will require considerable time to implement it in totality. Because of the time gap from its preparation to its implementation, certain developments might take place which may lead to modify, alter; some proposals. Hence implementing agencies must be qualified and experienced technical persons with the required knowledge of modification, if required, without changing the basic principle of the plan.

#### *Preparation of Plan*

The preparation of Drainage Master Plan for Jorhat will be undertaken by the Town and Country Planning Department shortly after the finalization of the Revised Jorhat Master Plan 2041.

Recently the preparation of a GIS based Drainage Master Plan for Greater Jorhat Revised Master Plan Area has been taken in hand by Gujarat University under a research project of ISRO. Professor Dr. Nandita Goswami of Gujarat University, who hails from Jorhat, has taken the initiative for this project.

#### **6.1.3 Sanitation**

As per survey, most of the households in the Jorhat urban agglomeration area had toilet facilities. Sanitary latrines are provided in almost all the newly constructed houses (AT & pucca), in the planning area. The discharge water of sanitary latrine has no alternative but to percolate underground, that pollutes the ground water. There is no sewerage network in the planning area.

Some of the households in the towns are equipped with ordinary septic tanks and the slum dwellers in the catchment areas of the river have kuccha latrines. However, around 235 toilets have been constructed in the Jorhat district under the 'Daan Toilet' mission which is an initiative of Swachh Bharat Abhiyan to achieve open defecation free area.

#### **6.1.4 Sewerage**

In any urban agglomeration, collection conveyance and treatment of sewage generated cannot be neglected considering the health and well-being of the society. This is the reason why the NITI Aayog has emphasized in its plan that all cities and urban areas should have compulsory sewage treatment facilities.

There is no sewerage network in the planning area. As per survey, most of the households such as individual buildings such as residential, commercial and institutional have their individual

toilets provided with the septic tanks. These septic tanks are either with soak pit or with effluent entering into the main drains along the road network. The remaining households depends on the shared toilets or community toilets. The septic tanks are also not properly maintained and the effluent from the septic tanks either percolates through the soil to ground water or find its way through drains and cross drains to the rivers, which are the sources of water supply. The households mainly have septic tanks for treatment of human excreta but the sullage (i.e., kitchen and bathroom waste) is discharged into drains which ultimately pollutes the fresh water sources.

The untreated wastewater reaching the rivers is of serious health concerns. Water borne diseases are spreading frequently in areas with no proper sanitation facilities and in recent future, if the trend continues, Jorhat will also have to face grave problems of water borne diseases like cholera, dysentery etc. So, it is of at most importance to propose and implement sewerage system for Jorhat area.

#### **6.1.4.1 Estimation of Wastewater Generation**

The total water requirement for the Master Plan Area is 69.80 MLD (by the year 2041). As per the CPHEEO guideline, 80% of the total water demand is considered as the sewerage flow; therefore, around 55.84 MLD water is expected to go in sewerage lines. As time passes, the area is expected to grow and along with high water demand, there will be larger wastewater discharge; hence, the project area required systematic sewerage system so the wastewater will not be discharged in the natural drains, which will help in reducing the flood problem. There should be underground sewerage connection to each household and from where the discharged wastewater should go to the sewerage treatment plant.

For treatment of wastewater generated from the planning area, a decentralized wastewater treatment system would be more appropriate. The centralized sewage treatment system appears inappropriate as it may end up with very huge sizes of sewers and various issues of conveyance in handling this huge quantity of wastewater.

#### *Standards of designing a STP*

1. As per the CPHEEO manual, the design life of the decentralised wastewater management system is 15-30 years.
2. For civil works design life is 30 years and machinery items are 15 years.
3. As per the CPHEEO manual, 80% of the water supply, or wastewater flow of 108 lpcd is accounted for by wastewater management.
4. According to MoHUA Guidelines on decentralised wastewater management systems, it is considered for a design period of 15 years or an additional 20% of total capacity for a design period of 30 years.
5. According to URDPFI, activated Sludge Process is widely used for recycling wastewater, which requires 0.15-0.25 hectare of land per MLD of recycling.

#### *Calculation for future wastewater generation and STP*

Water supply average of 135 LPCD

80% of the water supply is the quantity of wastewater = 108 LPCD

Total Volume of wastewater Generation for the year 2041 = Total Projected Population x Per capita generation

$$= 3,33,055 \times 108 = 3,59,69,940 \text{ L/d} = 35.96 \text{ MLD}$$

For 30 years of design life, an additional 20% of total capacity is required, then gross volume is equal to 1.2 times of the net total volume i.e.,  $1.2 \times 35.96 \text{ MLD} = 43.15 \text{ MLD}$ .

Therefore, land required for the design of total number of wastewater management systems.

$$= 0.15 \times \text{gross volume} = 0.15 \times 43.15 \text{ MLD} = \mathbf{6.47 \text{ Hectare.}}$$

*\*Note: Decentralized Sewage Treatment Plants shall be opted by dividing the total load of the STP.*

#### 6.1.4.2 Best Practices

*Decentralized wastewater treatment system at Bankers Colony, Bhuj*



Fig. 6.1 STP in Bhuj (Source: Hunmarshala)

❖ Location: Bankers Colony, Bhuj, Gujarat

❖ Scale: Community

❖ Designed Capacity: 30 KLD

❖ Area: 300 sqm

❖ Operational since: 2006

❖ Capital cost: ₹ 14-15 lakhs

❖ O&M: ₹1-1.5 lakhs/year

❖ Implementing organization: Hunmarshala Foundation, Municipality of Bhuj and Kutch Navnirman Abhiyan, funded by American India Foundation and Care today group.

Performance (Hunshala Foundation)	
Biochemical Oxygen Demand	91 %
Chemical Oxygen Demand	81 %
Total Dissolve Solids	98 %

#### 6.1.4.3 Action Plan for Sewerage Management

1. Grey Water recycling at neighbourhood level. Kitchen waste water to be compulsorily recycled and used at individual building/township level in all new developments.

2. Separation of Kitchen waters from other grey water sources through awareness by administration, and through mandatory checking while obtaining building permission.
3. Formulation of action plans for cleaning and restoring the Tocklai River and several Jans/water bodies.
4. Decentralisation of STPs on the neighbourhood level. Proposal of small package STPs/Bio-STPs at individual level.
5. Preservation of natural water bodies which helps in natural treatment of waste water.

### 6.1.5 Solid Waste Management

Like most of the urban centers of our country, the Municipal Solid Waste Management (MSWM) remains as one of the most neglected areas of urban development in the Jorhat Municipal Area. The Local Administration of Jorhat is found to have a conventional and primitive system of solid waste management. A systematic and scientific SW collection, disposal and management are found to be absent in Jorhat. People still adopts the practice of throwing wastes on streets or open drains and vacant lands. Due to SW dumping in the open drains and open lands, the soil quality degrades as a result, and the SW blocks the drain, which results in water logging. Plastics get mixed up with soil, clogging natural flow of water through soil. This loosens the soil bond and cohesion which ultimately leads to soil erosion.

#### 6.1.5.1 Existing Scenario

On an average, daily 60-63 tons of solid wastes are produced, including waste generated from hospitals & nursing home, industrial units, slaughter house, markets etc out of which 68% is bio degradable. Daily 90-95 (with drain cleaning staff, it is about 185-190) sweepers are employed to clean the streets, mainly in the core area of the city. 7 numbers of ACE Tipper, 1 number 407 Tipper, 3 numbers of Compactor Truck, 11 numbers of tractor, 1 number of Lodger, 1 number of Mini Truck, 1 number of Excavator, 1 number of BackHoe Loader and Dozzer are engaged to lift the MSW daily and dump in open site located at Garamur Dumping Ground with an area of 15 bigha of land (Approx.). About 22-25 tons of wastes, (38.2%) are left in the street and in drain uncollected daily; that creates a difficult environment problem. 120-130 numbers of bins are provided to store waste within the town and outskirts of town in the master plan area, which are to be removed in order to make the city dustbin free. Open dumping has created lot of environmental problem like foul smelling, source of generations of disease, land-air-and water pollution and attract bird activities that disturb air traffic.

Presently, the home collection of solid waste is going on covering all the wards of Jorhat Municipal Board and it is a very good initiative to make the municipal area dustbin free.

#### 6.1.5.2 Estimation of Solid Waste Generation

Table 6.11 Solid Waste Demand

Sl no.	Particulars	Demand for 2031	Demand for 2041
1	Projected Population	2,98,814	3,33,055
2	Solid Waste Generation (in Master Plan Area @0.5 kg/cap/day)	<b>149.407 MT</b>	<b>166.5275 MT</b>
3	Projected Population of JMB	87,673	95,618
4	Solid Waste Generation (in Existing Municipal Area @0.5 kg/cap/day)	<b>43.8365 MT</b>	<b>47.809 MT</b>



Source: CPHEEO/Compilation by T&CP, Jorhat

*Standards and URDPFI guideline*

Zero waste and waste recycling: Urban waste should be recognised with a significant proportion of organic constituents, which as a resource for energy generation in an environmental manner. Energy in the form of biogas, heat or power should be seen as a bonus, which improves the validity of such a project. In the case of existing landfills, bioremediation of waste is recommended to reclaim the land and convert organic waste into useful products, which will result in the reduction or elimination of greenhouse gas emissions.

**6.1.5.3 Action Plan for Solid Waste Management**

1. Minimum garbage shall be generated.
2. *Reuse*: Reuse everything to its maximum after properly cleaning it. Garbage into manures or other useful products.
3. *Segregation at Source*: Store organic or biodegradable and inorganic or non-biodegradable solid waste in different bins. The colour of the bins shall follow the international standard.
4. *Provision of Solid Waste Storage*: One of the immediate measures to revamp the existing collection services structure would involve provision of covered community waste bins at proper distances for the people to deposit domestic waste. Authority should take steps to stop and discourage throwing of garbage on roads and open sites by public.
5. 4Rs: Refuse, Reduce, Reuse & Recycle
  - a. Refuse: Do not buy anything which we do not need.
  - b. Reduce - Reduce the amount of garbage generated. Alter our lifestyle so that minimum garbage is generated.
  - c. Reuse - Reuse everything to its maximum after properly cleaning it. Make secondary use of different articles.
  - d. Recycle – Keep things which can be recycled to be given to rag pickers or waste pickers.
6. Convert the recyclable garbage into manures or other useful products.
7. *Different treatments for different types of solid wastes*: One must apply the techniques which are suitable to the given type of garbage. For example, the technique suitable for general market waste may not be suitable for house waste.
8. *Treatment at the nearest possible point*: Solid waste should be treated in as decentralized a manner as possible. The garbage generated should be treated preferably at the site of generation i.e., every house.
9. Capacity Building and Public Participation.
10. Biomedical waste shall be collected separately, and should be handled properly as per the **Biomedical Waste (Management and Handling) Rules, 1998**.
11. *Energy Generation from waste*: Electricity can be produced by burning MSW as a fuel. MSW power plants, also called waste to energy (WTE) plants, are designed to dispose of MSW and to produce electricity as a byproduct of the incinerator operation.



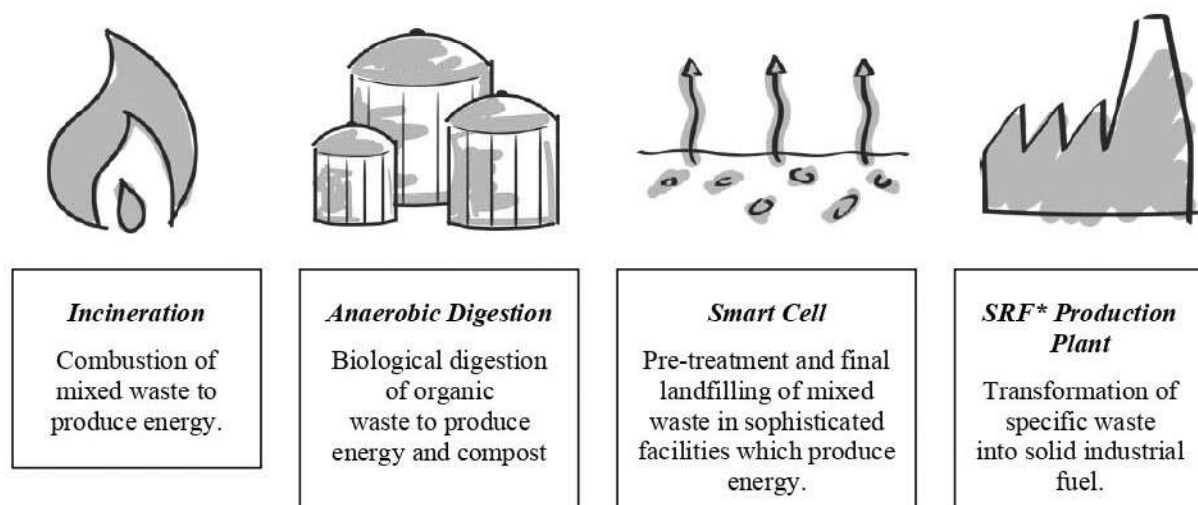
*A complete range of Waste to Energy processes*

Table 6.12 Solid Waste Management Action Plan

Sl no.	Generation Source	Action Proposed/Instructions
1	Residential	1. Keep food waste/biodegradable waste in a non-corrosive bin type - D1 2. Not to throw any waste in neighbourhoods, on streets, open space, and vacant lands, indrains or water bodies. 3. Keep dry/recyclable waste in bin type - D2 4. Keep hazardous waste separately.
2	Multistoried Buildings, commercial complexes, private societies	1 to 4 as above Provide separate bin type - B large enough to host wastes generated both biodegradable and recyclable. Direct member of the association/society to deposits waste in bins provided. Sanitary inspectors should vigil the area and fines should be imposed for not following the actions.
3	Slums	1 to 4 as above Use bin type -C
4	Shops, offices, Institutions	1 to 4 as above Store the waste in bintype - D1, D2
5	Hotels and Restaurant	1 to 4 as above. They should arrange their own bins and dispose waste in nearby municipal bins.
6	Vegetable, Fruit Markets, Meat, Fish Markets, and Street Vendors	Keep small baskets with them and transfer waste to large bin type - A Shopkeepers not to dispose of the waste in Open Space. Deposit waste as and when generated into bin type - A. Fines should be imposed for not following the action.

7	Marriage halls, Community Halls, Open Field Functions	1 to 4 as above.
		Provide a large bin type - B
8	Garden Waste	Compost the waste in garden itself, if possible.
		Store wastes in large bags or bins and transfers it to community bins.
<i>*Note: Bin Type A (Volume 7m<sup>3</sup>, Type B (0.75 m<sup>3</sup>), Type C (0.5 m<sup>3</sup>), Type D1 and Type D2 (12 litres)</i>		

Source: CPHEEO/Compilation by T&CP, Jorhat

#### 6.1.5.4 SWM Landfill Site

##### Current site assessment

The existing solid waste management site is located in Garmur Road, beside the Tocklai River. A total of 15 bigha is available for solid waste filling in the site. This site is not a suitable location, as it is located in the bank of a water body, due to which it can litter and pollute the river.



Fig. 6.2 Existing Landfill site (Source: T&CP)

##### Estimation of Land Fill area Required

Current Waste generation per year (W) =  $2,69,572_{(2021)} \times 0.6 \times 365 / 1000 = 59,036.2$  (tons per year)

(Use rate of population growth where waste generation growth rate estimates not available)

Proposed life of landfill (in years) (n) = 30 (years)

Waste generation after n years –  $W (1 + x)^n$  (tons per year) –  $59,036.2 (1.023)^{20} = 93,031.7$  T/Year

(The estimated rate of increase (or decrease) of waste generation per year (x) = 2.3%)

Total waste generation in 20 years (T) in tons

$$T = 0.5 [W + W (1 + x)^n] \times n \text{ (tons)}$$

$$= 15,20,679 \text{ T}$$

Total volume of waste in 20 years ( $V_w$ ) (on the assumption of 0.85 t/cm.m density of waste)

$V_w = T / 0.85$  (cu.m.) = 17,89,034.1 Cu.m

Total volume of daily cover in n years ( $V_{dc}$ ) (on the basis of 15 cm soil cover on top and sides for a lift height of 1.5 to 2 m)

$$V_{dc} = 0.1 V_w \text{ (cu.m.)} = \mathbf{1,78,903.4 \text{ cu.m}}$$

The total volume required for components of the linear system and of the cover system (on the assumption of a 1.5m thick liner system *(including leachate collection layer)* and 1.0 m thick cover system (including gas collection layer)

$$V_c = k V_w \text{ (cu.m.)} = 0.125 * 17,89,034.1 = \mathbf{2,23,629.3 \text{ cu.m}}$$

( $k = 0.25$  for 10 m high landfill, 0.125 for 20 m high landfill and 0.08 for 30 m high landfill. This is valid for landfills where the width of landfill is significantly larger than the height)

Volume likely to become available within 10 years due to settlement/biodegradation of waste

$$V_s = m V_w \text{ (m will be less than 0.05 for incinerated/inert waste)}$$

$$= 0.05 * 17,89,034.1 = \mathbf{89,451.7 \text{ cu.m}}$$

The final estimate of landfill capacity ( $C_i$ )

$$C_i = V_w + V_{dc} + V_c - V_s \text{ (cu.m.)}$$

$$= 17,89,034.1 + 1,78,903.4 + 2,23,629.3 - 89,451.7 = \mathbf{21,02,115.1 \text{ cu.m}}$$

Topography = plane area

The shape of the Landfill is Rectangular in plan (*length: width = 2:1*) primarily above ground level, and partly below ground level.

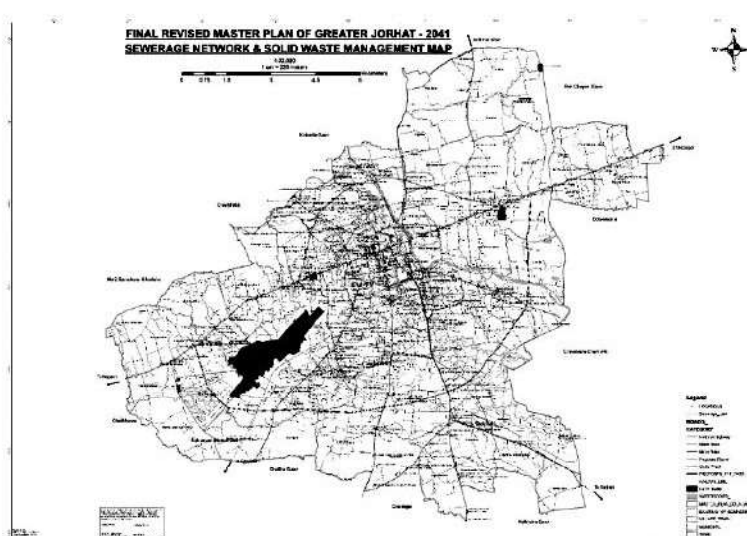
Proposed Maximum Landfill Height = 10 m

Area required =  $2102115.1/10 = 2,10,211.5 \text{ sq.m}$  or **21.02 Ha**

In real scenario, only a third of the total land requirement, i.e., 7 Ha shall be enough, as most of the residential establishments outside the municipal area decompose the organic waste in garbage pits within the residential campus itself. Ragpickers and paid solid waste collectors collect waste from households on weekly basis, which is then dumped in the municipal solid waste landfill site.

#### *Proposed site*

A site of an area of 81 bighas of land about 20 Kms away from the city has been bought by Jorhat Municipal Board but which is not at all suitable for dumping of waste as it touches the Kakodunga River on its western boundary and which will contaminate a natural stream and also affect the flora and fauna of a large area. The distance from the river to the proposed site is about 150 meters. Town & Country Planning has proposed a Grazing ground site on the Dahikhor village just inside the Master Plan Boundary which is at approximately 6.5 km from the city. Final decision is awaited. Also, a place near Dhekorgorah has been earmarked for FSTP.



Map 6.1 Proposed Solid Waste Management site

Final decision is awaited. Also, a place near Dhekorgorah has been earmarked for FSTP.

### 6.1.6 Power

Jorhat Town and the Rural Areas in the Greater Jorhat Revised Master Plan area for Greater Jorhat have been electrified by the A.P.D.C.L. Present capacity of power supply in the planning area during peak hours is 35.0 MW. The power supplied to the planning area is from the 132/33 kV Jorhat Sub-Station of Transformation Capacity 1x16 + 2x25. The number of households have electrical connection in Jorhat Urban Agglomeration, is 32727 which includes 4917 nos. commercial, 264 industrial and 27 nos. road lighting connections. (Source: Census of India, 2011). Shortage of power during peak hours and in peak seasons is serious.

#### 6.1.6.1 Power Supply Grid of Jorhat

List of Substations and their respective capacity under Jorhat Electrical Division – I of Jorhat Electrical Circle are given in the **Table 6.13** below. The power supplied from this system includes the whole of Jorhat Sub division.

Table 6.13 List of Power substations in Jorhat Subdivision

Sl no.	Name of Sub-Division	Name of 33/11 KV Sub- Station	Capacity of substation		
			No of Transformer	Transformer Capacity (MVA)	Total Capacity (MVA)
1	Jorhat ESD-I	Garmur SS	2	5	10
2		Gotonga SS	2	5 and 3.15	8.15
3		Murmuria SS	2	5	10
4		Hatigarh Bypass SS	2	10	20
5	Jorhat ESD-II	Jorhat SS	3	10 and 5	25
6		Lichubari SS	2	5	10
7		Sadar Cinnamara SS	2	5	10
8	Jorhat ESD-III	Kolakhowa SS	2	3.15 and 2.5	5.65
9		Pulibar ss	2	3.15 and 2.5	5.65
10		Panichakua SS	2	5	10
Total			21		114.45

Source: APDCL

#### 6.1.6.2 Estimation of Power Demand

According to National Electricity Policy, 2005, total power consumer is projected at 1000 units/capita/year (i.e., 2.73 kWh/capita/day) for the year 2012. As per Ministry of Electronics and Information Technology, avg. annual per capita electricity consumption in India is at 1225 units (i.e., 3.35 kWh/capita/day) for the year 2021-22. Keeping in mind the future demands, the per capita consumption of electricity is considered as 1500 units/capita/year for the year 2041 (i.e., 4.1 kWh/capita/day). The power demand calculation for the projected population in Greater Jorhat Master Plan Area for the year 2041, and the requirement for intermediate stage at the year 2031 is given below.

Table 6.14 Power Demand in GJRMF area

Sl no.	Particulars	Demand for 2031 (per day)	Demand for 2041 (per day)
1	Projected Population	2,98,814	3,33,055

2	Power Demand (in Master Plan Area @4.1 kWh/cap/day)	<b>51.05 MW</b>	<b>56.70 MVA</b>	<b>56.90 MW</b>	<b>63.20 MVA</b>
3	Projected Population of JMB	87,673		95,618	
4	Power Demand (in Existing Municipal Area @4.1 kWh/cap/day)	<b>14.98 MW</b>	<b>16.64 MVA</b>	<b>16.33 MW</b>	<b>18.15 MVA</b>

Source: Ministry of Power (GoI)/Compilation by T&CP, Jorhat

## 6.2 Social Infrastructure

Social infrastructure plays an important role to provide quality of life to the residents of the city. The effectiveness of social infrastructure in achieving the objective of city development plan would depend upon its capacity to contribute to improvement in the quality of life, enhanced self-dependency and city's sustainability. The level of social infrastructure shall aim the creation of liveable city through reducing the sense of alienation among the residents with less dependence on other settlements for basic infrastructure.

Social infrastructure refers to the facilities and mechanisms that ensure education, health care, community development, and social security, recreational and social welfare. The development cannot be looked at in isolation without considering the basic needs of the people, and a significant level of investment is needed in this sector. Usually, this development referred to as the commitment towards realizing the vision of the city.

It is desirable that any planned urban area should have a hierarchical distribution of various social facilities, so as to ensure equitable distribution of essential facilities and services at different levels.

For the Greater Jorhat Master Plan Area, a residential area with an approximate population of 8,000- 10,000 is conceived as a basic nucleus - a neighbourhood, with secondary school and shopping facilities for day-to-day needs. Distribution of higher level of additional facilities for health, education, recreation and safety, is organized at community, district, zone and city level and this framework provides a basic structure for facility planning. However, such a structure can be taken only as a broad guideline. Distance factor is also important and need to be taken into consideration for facility distribution.

### 6.2.1 Education Facilities

Education is an important factor influencing the quality of life of the people and future development of an area. It empowers them with skills and knowledge and helps them to better lead their life and to access best of the employment opportunities available in the market. This in turn will impact the work force participation rate and economy of the area.

#### 6.2.1.1 School Education

The existing scenario of Primary and Secondary School education for the Greater Jorhat Master Plan Area is given below.

##### *Primary and Secondary Education*

According to 2011 census, literacy rate in the Jorhat Municipal Area is 90.63, while its neighboring census towns/ villages, (included in the Jorhat Urban Agglomeration, 2011), have



a literacy rate of more than 91.00%. As per the primary survey conducted by the Town & Country Planning, Jorhat and information compiled from Census of India, 2011 as well as Education Department etc., the following Table is prepared to show the no. of educational institutions upto 10+2 level in the revised master plan area for Greater Jorhat. There are number of English as well as Assamese medium Private Schools from Kinder Garten to 10+2 level in the towns and villages within the planning area under SEBA, CBSC and ICSE and many of these are residential too. A no. of Junior Colleges has been established in the last decade within Jorhat Town & GJRMP area.

The **Table 6.15** given below depicts the education facilities quantitative requirement analysis. The results of the analysis shows that there is no gap which is a good indication.

*Table 6.15 Education facilities gap analysis in GJRMP area*

Sl no.	Particulars	Current Level (2011)	Desired Level as per URDPFI Guideline	Demand for 2031		Demand for 2041	
				Demand	Gap	Demand	Gap
	<b>Populations</b>	2,45,331		2,98,814		3,33,055	
1	Pre-Primary, Nursery School	201	2500	120	-	133	-
2	Primary School (Class I-V)		5000	60	-	67	-
3	Senior Secondary (VI-XII)	69	7500	40	-	44	-
4	Integrated School without hostel facility (I-XII)	10	100000	3	-	4	-
5	Integrated School with hostel facility (I-XII)		100000		-		-
6	School for Physically Challenged	1	450000	1	-	1	-
7	School for Mentally Challenged	-	1000000	1	-	1	-

Source: URDPFI/Compilation by T&CP, Jorhat

### **6.2.1.2 Higher Education**

The existing scenario of Primary and Secondary School education for the Greater Jorhat Master Plan Area is given below.

#### *Industrial Training Institute*

There are two Industrial Training Institutes (ITI) in GJRMP area. Govt. ITI, located in the town, which offer certificate courses in Draughtsman (Civil), Draughtsman (Mechanical), Dress Making, Electrician, Fitter, Machinist, Mason (Building Constructor), Mechanic (Motor Vehicle), Mechanic (Refrigeration and Air-Conditioner), Mechanic (Tractor), Mechanic Diesel, Mechanic Radio & T.V., Plumber, Sewing Technology, Stenographer & Secretarial Assistant (English), Surface Ornamentation Techniques (Embroidery), Surveyor, Turner, Welder, Wireman. Kenduguri Private ITI located in Gogain Tekela Gaon which provide short-term courses of different trade viz. Electrician, Fitter, Welder, Mechanic Diesel.

#### *Prince of Wells Institute of Engineering and Technology (POWIET)*

HRH The Prince of Wales Institute of Engineering and Technology was established in 1927 by the British Government within Jorhat municipal limit. It is the first engineering institute established in India's North Eastern Region that was given to British Government in 1922 for